

SPECIAL ISSUE CONTAINING REPORTS OF THE SESSIONS OF SECTIONS AND SOCIETIES
AT THE SECOND NASHVILLE MEETING OF THE AMERICAN ASSOCIATION FOR
THE ADVANCEMENT OF SCIENCE AND ASSOCIATED SOCIETIES. EDITED
BY BURTON E. LIVINGSTON, PERMANENT SECRETARY

SCIENCE

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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE THE RESPONSE TO THE ADDRESSES OF WELCOME AT THE OPENING SESSION AT NASHVILLE

(By President A. A. Noyes)

In response to your welcomes I would say at the start we are heartily glad to be here! And this for various reasons: First of all, we look forward to enjoying the famed hospitality of the South in this, one of its leading cities, and to becoming acquainted with its people. But more important still is the hope that our visit here may in some small measure contribute to the already active scientific and educational development of this section of the country. One of your distinguished writers, Professor Mims, has recently described for us "The Advancing South"; and most important among its many advances is, as he rightly emphasizes, that of its intellectual life. The purpose of this association is the advancement of science in its broadest sense; and it is glad to meet again in the South for the reason that conditions are now clearly propitious for a rapid extension of scientific activities here.

I desire especially to reciprocate Dr. Kirkland's greetings from the educational institutions of this state, and to thank them for their cordial welcome. The present success of these institutions affords the best assurance that this state will play its part in the larger development of science which is to take place during the next decades in this country and especially in the South.

It might be desirable on the occasion of this fifty-year anniversary of the former Nashville meeting, to review in broadest outlines the advance of the sciences during the last half-century; but this would be more suitable for the substantial address of a retiring president than for the short responses which I am making to your kind welcomes. I may, however, briefly refer to certain pronounced changes in the viewpoints of scientific investigators.

About forty years ago the physical sciences, physics and chemistry, seemed to have reached a nearly stationary condition, as exemplified by the oft-quoted remark of an eminent physicist that the future advances of physics were to consist in adding another

decimal place to the known values of natural constants—which reminds me of the remark of a distinguished scientist who, when asked why he did such work, replied, "I guess I am like the Irishman that said, 'When I see a head, I hit it,' so when I see an inexact constant I go at it." Moreover, scientists in those fields were becoming over-conservative in the scientific use of the imagination. Thus the philosopher-scientists Mach and Ostwald in Germany urged that the primary aim of science is a representation of natural phenomena without the aid of hypothesis. Then in 1886-87 burst into the realm of chemistry the general theory of solutions of van't Hoff, the ionic hypothesis of Arrhenius, and the development of these theories by Nernst and others; and a new branch of chemistry, physical chemistry, came into being. In physics during the last decade of the nineteenth century the discoveries of X-rays by Roentgen, of radioactivity by Becquerel and the Curies, and of the phenomena of gaseous conduction by J. J. Thomson, opened the way for a most extraordinary development of physical science—that of modern sub-atomic or electronic physics. Physicists became eager, optimistic, imaginative; and volumes of exciting discoveries poured out of the laboratories of the world. Relativity, non-Euclidean geometry, and non-Newtonian mechanics appeared on the scene. The exactness under all conditions of the most fundamental laws of physics was questioned and reexamined. Energy came onto the stage, and matter took a back seat. A less mechanistic conception of natural phenomena arose.

In the meantime in the biological sciences the existence of evolution as a fundamental phenomenon of life was established by converging evidence from paleontology, embryology, genetics, and comparative anatomy, with a certainty comparable with that of the Copernican conception of the solar system. While even less can be said to-day of the processes by which evolution takes place than was thought to be known fifty years ago, the facts that evolution has been going on and that many animal and plant types have gone through definite stages of development can only be doubted by an individual who like an ostrich buries his head in the sand out of a vague dread that he may see something shocking.

These advances in the physical and biological sciences have greatly influenced the philosophic and religious thinking of the scientific man; for it is a great mistake to think the tendency of advancing science is towards materialism. Just the opposite. The repeated discoveries of new and unexpected types of phenomena in the physical world make us realize more than ever the limitations of our understanding, and lead us to feel with Tennyson that "as knowledge

grows from more to more, will more of reverence in us dwell." And we like to repeat to ourselves the words of a poet-scientist of England (Whetham):

We scatter the mists that enclose us
The seas are ours and the lands,
The quivering ether knows us
And carries our quick commands.
From the blaze of the sun's bright glory
We sift each ray of light;
We steal from the stars their story
Across the dark space of night.

But beyond the bright search-lights of science,
Out of sight of the windows of sense,
Old riddles still bid us defiance
Old questions of why and whence.
There fail all sure means of trial
And end all the pathways we've trod
Where man by belief or denial
Is weaving the purpose of God.

Moreover, the fuller establishment of evolution as a principle of life, and the implication of that principle that man in his present state may be "the herald of a higher race," give us a system of ethics which makes us charitable to the failings of our fellow men and eager to work for the further development of our race; also a religious viewpoint which leads us, more than any static ready-made universe could do, "to reverently ponder the ways of God." To us the process of evolution becomes the most striking manifestation in all nature of the underlying power "which passeth all understanding"—a view so finely expressed in the well-known words of another poet:

A first-mist and a planet,
A crystal and a cell,
A jelly-fish and a saurian,
And caves where the cave-men dwell,
Then, a sense of law and beauty
And a face turned from the clod;
Some call it Evolution,
And others call it God.

We are delighted to receive also the welcome from the civic interests of this state; for science needs the aid of the intelligent men engaged in other professions and in industry and commerce. There are few things more promising for the advancement of science in this country than the whole-hearted way in which leading men of affairs are interesting themselves in the promotion of research. And most significant is the fact that this interest applies not so much to research in its application to their own industries (shown by the establishment of great research laboratories, such as those of General Electric Company, American Telegraph and Telephone Com-

pany, the du Pont Company, and many others), as to fundamental research in pure science.

The last year has afforded a striking instance of this—the only one I have time to mention. The National Academy of Sciences, a sister organization of this association, realizing that America, in proportion to its wealth and population, is not contributing anything like its share to the advancement of science, and believing that this is largely due to very inadequate financial support of the investigators of this country, undertook to secure from our larger corporations a fund of \$20,000,000 for the promotion of research in all the varied branches of pure science. It was clearly seen that the first step in such a campaign must be to get the aid of prominent men of affairs, whose support would carry weight with our industrial leaders. The first remarkable thing was that there was no difficulty whatever in securing this support. Herbert Hoover, in spite of his many obligations, accepted the chairmanship of the board of trustees of the fund; and such men as Elihu Root, Charles Hughes, Andrew Mellon, Owen Young, John W. Davis, Edward House, J. J. Carty, and Gano Dunn became members of the board and have for the most part taken an active part in its work. The second remarkable thing was that there was no need of convincing either these men or the leaders of industry consulted that the fund should be used for research in science itself rather than in its industrial applications. They saw that the latter was a field of research that should be prosecuted by the industries themselves within their own establishments—not by universities or endowed research institutions. They realized too, as Professor Tyndall said in substance fifty years ago in his lectures in New York, that "just as the stream dwindles when the fount dries, so surely will technical developments lose all vitality when they cease to be nourished by new scientific discoveries." Scientific discovery "puts not only money into the pockets of individuals, but millions into the exchequers of nations," yet even greater are its intellectual and spiritual contributions to the welfare of mankind.

Well, the campaign was undertaken under these favorable auspices, and is now progressing satisfactorily. Already a considerable sum payable through a period of ten years has been secured, and the prospects are good for more.

But it is not alone on the financial side that science needs the support of the intelligent people of any community. While *science* has through daily experience come to be universally recognized as vitally important, yet it is often not realized that science does not "just grow"—that it arises from *research*, and that research is a sensitive plant which will grow successfully only from carefully selected seeds—the best

brains of the nation; and which must be protected against the frost of dogmatic intolerance, against the drought of administrative routine, against the flood of modern mass education, against overforcing through the impatient demands of practical men, and against the blights of poverty and social neglect. Research will come to its own in any community only when its members, in the words of Pasteur, regard their research laboratories as their temples.

THE NEWLY-ELECTED PRESIDENT OF THE AMERICAN ASSOCIATION

ALL who are interested in the advancement of science in America and in the world at large must be deeply gratified by the election of Henry Fairfield Osborn as president of the American Association for the Advancement of Science. This is the highest honor that can come to an American worker in science from his colleagues, and Professor Osborn's work is surely an excellent example of the finest endeavor for which the American Association stands. Primarily a vertebrate paleontologist his influence for advancement has been much broader than that field. His work has been remarkably effective in many lines of scientific thought. He is well known as a research worker, author, educator and administrator.

The president-elect was born at Fairfield, Connecticut, on August 8, 1857, the son of William Henry and Virginia Reed (Sturges) Osborn. On the paternal side he is descended from the Osborns of Salem, Massachusetts, of the colonial period. On the maternal side his descent is from Nathan Gold and Andrew Ward, of the time of the Revolution, and from Rev. Ebenezer Pemberton, one of the three founders of Princeton College. His maternal grandfather was Jonathan Sturges, who was president of the New York Chamber of Commerce. His father was a founder and for many years president of the Illinois Central Railroad.

Educated at the Columbia Grammar School and Lyons Collegiate Institute, of New York City, and at Princeton College, Osborn received the A.B. degree in 1880. He was greatly influenced by President McCosh in philosophy and by Professor Arnold Guyot in geology. His field work in paleontology began immediately after graduation, for he took part in geological expeditions to Colorado and Wyoming in 1877 and 1878. In 1878-79 he took courses in anatomy and histology at the College of Physicians and Surgeons and at Bellevue Medical College, in New York City. In the year 1879-80 he studied embryology at Cambridge University, under Francis Balfour, and comparative anatomy in London, under Thomas Henry Huxley. He also spent some time in Germany. Having held the first E. M. Biological

Fellowship at Princeton for the years 1880-83, he was appointed assistant professor of natural science at that institution in 1881, and professor of comparative anatomy in 1883, where he remained seven years.

Professor Osborn was called to Columbia University in 1890 to the Da Costa chair of biology. Here he organized the zoological department, instituted scientific expeditions and started the Columbia Biological Series of publications, which he edited for a number of years. In 1894 he served on the administrative board of publications and as a trustee of Columbia University Press. From 1892 to 1895 he was dean of the faculty of Pure Science at Columbia University. He retired from active teaching in 1910, but since then has remained in Columbia as research professor of zoology.

The new president's career in university work has been amply adequate for very great eminence, but he has also won the position of dean of American museum organizers and administrators. Throughout the last nine years of his Columbia period he served as curator of the department of vertebrate paleontology in the American Museum of Natural History, New York City. In the last named year he withdrew from the active curatorship and he has since then been honorary curator. To research, writing, editing and the administration of the museum he has devoted the last thirty-seven years. He was assistant to the president from 1899 to 1901 (when he inaugurated the present internal organization of the museum and started the museum journal and the memoir series of publications), trustee and vice-president from 1901 to 1908, and he has been president of the Board of Trustees since the death of President Jesup in 1908.

As curator in vertebrate paleontology, President Osborn led in the organization of many expeditions that went out from the American Museum in search of vertebrate fossils, largely to the regions made famous by the pioneer work of Leidy, Cope and Marsh. He was a member of the exploration parties of 1893, 1897, 1903, 1906, 1907, 1908, 1909 and 1910 and he has also accompanied some expeditions of later years. In 1907 the expedition to the Fayûm, in Egypt, secured, among many other valuable finds, fossils representing two very early stages in the evolution of the elephant and led to the Memoir on the Proboscidea now in press. His earlier prediction that Africa is to be considered as the original homeland of this great mammal appears to have been fully confirmed.

During the administration of President Osborn have occurred remarkable advances in paleontological technique at the American Museum of Natural History, and great improvements in the teaching value of the exhibits, through attractive grouping and posing. In

his museum period has been assembled what is said to be the most extensive collection of vertebrate fossils in existence, notably the collections of fossil horses and of fossil proboscideans representing geological times from the Tertiary forward. These fossil collections have become a standard of excellence. The president has continually encouraged and stimulated research and the distribution of knowledge of natural history in the City of New York. His many and important contributions to public education were the reason for his receiving the Roosevelt Medal of Honor, presented by President Harding in 1923.

Professor Osborn has also a fine record of research achievement in the U. S. Geological Survey, to which he was appointed, as vertebrate paleontologist, in 1900. He was promoted to the rank of senior geologist in 1924. In this connection he is bringing out his greatest research contribution, a monograph on "The Titanotheres of Ancient Wyoming, Dakota and Nebraska," which is now in press.

As chairman of the executive committee of the New York Zoological Society (1896-1903, 1907-1909), Dr. Osborn organized and established the administrative and scientific work of the society and supervised details of the plans for the splendid facilities of the New York Zoological Park. He was vice-president of the Zoological Society in 1897 and president from 1909 to 1923. As a mark of its appreciation of his long-continued interest and devotion, the New York Zoological Society has elected him to honorary presidency for life.

In 1906 Professor Osborn was elected to the secretaryship of the Smithsonian Institution, held to be the most honored scientific post in the United States, but he was obliged to decline. He has held the presidency and other responsible offices in many American scientific and educational organizations. He is a member of the National Academy of Sciences and the American Philosophical Society and an associate fellow of the American Academy of Arts and Sciences. His name is on the rolls of a very large number of learned organizations, both American and foreign. He has received many medals of honor and numerous honorary degrees.

The president-elect became a member of the American Association for the Advancement of Science in 1881, being elected to fellowship in 1883. He became a life member in 1917. He is shown, on the cards of the Washington office, as specially interested in Sections E (Geology and Geography), and F (Zoological Sciences). He was vice-president (for Section E) in 1892 and has served the association in various other capacities from time to time. His scientific record and his leading position in affairs that interest scientific workers make Professor Osborn an excellent

choice to represent the work and ideals of the American Association.

Professor Osborn's publications are many and in many fields. According to available information he has published seven scientific memoirs, eleven books and over seven hundred papers. He edited "A Naturalist in the Bahamas" (1910), a memorial to Dr. John I. Northrup, and "Fifty Years of Princeton, '77" (1927). The following are the titles of his books: "From the Greeks to Darwin" (1894), "Evolution of Mammalian Molar Teeth" (1907), "The Age of Mammals" (1910), "Huxley and Education" (1910), "Men of the Old Stone Age" (1915), "Origin and Evolution of Life" (1917), "Impressions of Great Naturalists" (1924), "The Earth Speaks to Bryan" (1925), "Evolution and Religion in Education" (1926), "Creative Education in School, College, University and Museum" (1927), "Man Rises to Parnassus" (1927). A survey of his published papers shows 14 on geology, 35 on zoology, 24 on comparative anatomy, 3 on eugenics, 30 on anthropology, 77 on evolution, 285 on paleontology, 52 on education, 5 on psychology, 80 on biographic subjects, 52 on administrative subjects and 36 in other fields.—B. E. L.

REPORTS OF THE SESSIONS OF SECTIONS AND SOCIETIES AT THE SECOND NASHVILLE MEETING

THE general reports of the second Nashville meeting have been published in SCIENCE for January 27. The present issue is mainly devoted to special reports of the sessions of the several sections and of the societies that took part in that meeting. Almost all reports from section or society secretaries were in hand by January 14. These have been edited and assembled for the following pages.

The permanent secretary is very grateful to the secretaries of the sections and societies for their hearty cooperation in this work, especially for the promptness with which the reports have been received this year. The material here presented is classified according to the sections of the association, after the manner of the arrangement of the general program of the meeting. It is to be noted that the days of the week mentioned are those from Monday, December 26, to Saturday, December 31, 1927.

SECTION A (MATHEMATICS)

Vice-president and chairman, R. C. Archibald; retiring vice-president, Dunham Jackson; secretary, C. N. Moore, University of Cincinnati, Cincinnati, Ohio. With the section met the American Mathematical Society (president, Virgil Snyder; secretary, R. G. D. Richardson, Brown University, Providence, R. I.) and the Mathematical Association of America

(*president, W. B. Ford; secretary, W. D. Cairns, Oberlin, Ohio*).

(Report from R. C. Archibald)

Section A held a joint session Thursday afternoon with the two affiliated organizations. Professors Jackson and Ford presided, and three papers were presented: the first by Professor E. V. Huntington, of Harvard University, retiring chairman of the section; the second by Professor Dunham Jackson, retiring president of the Mathematical Association of America, and the third by Professor Arnold Dresden, of Swarthmore College, representing the American Mathematical Society.—Professor Huntington gave a non-technical account of "The Notion of Probable Error in Elementary Statistics." This address was published in SCIENCE for December 30, 1927.

Professor Jackson spoke on "The Human Significance of Mathematics." It was contended that the significance of advanced mathematical study in human society is more profound than an analysis of the immediate applicability of current research would indicate. Mathematics is of great benefit in promoting the habit of exact thinking, in some at any rate, of those who have experience of it. The universality and permanence of mathematical truth make a profound appeal to the constructive imagination and constitute a bond of common experience between thinking men of all times and places. Since mathematical knowledge as we possess it is a product of human thinking, the process of acquiring it contributes materially to the comprehension of the manner of working of the human intelligence and of the extent to which reliance can be placed on the results of its free play. And since our knowledge comes only in restricted measure from the discoveries of the great leaders in the science, and very largely from the collective experience of the race, every serious student, whether personally engaged in research or not, may feel that he contributes something to the completeness of the structure. This paper is to be published in *The American Mathematical Monthly*.

Professor Dresden's paper dealt with "Some Philosophic Aspects of Mathematics." Discussions of the foundations of mathematics occasioned by recent work of Brouwer, Hilbert and others led to the consideration of certain questions which bear on the essential character of the subject; *viz.*, the meaning of "existence" in mathematics, and the basis for confidence in the validity of its conclusions. In its essential aspects, mathematics has no strictly objective basis, but is, in a very definite sense, subjective and temporal; belief in the validity of mathematical conclusions rests upon respected successful verifications made in the applications of mathematics.

The American Mathematical Society held sessions for the presentation of seventy-two papers on Wednesday morning and afternoon and Thursday morning. There were in attendance 138 members, a number that compares favorably with 188, the number who attended the Philadelphia meeting last year, the largest in the history of the society. There were also in attendance fifty-two non-members. At the first session Professor James Pierpont, of Yale University, gave an interesting address on "Mathematical Rigor, Past and Present," in which were rapidly reviewed some of the main features of the development of standards of rigor in analysis since the invention of the calculus by Newton and Leibnitz. Not until the days of Cauchy, Gauss, Abel and Dirichlet did analysts employ reasoning relative to infinite processes which resembles that of to-day. Improvement in rigor has in the main been brought about by discovering possibilities whose existence had not been suspected and which rendered a good part of former proofs unsatisfactory. The next step taken to give mathematical reasoning more strength is due to Weierstrass. Until his time geometric notions were freely admitted in analytic proof. But the discovery of continuous functions without derivatives made manifest the wide gap which existed between geometric notions and their analytic formulation. Weierstrass was thus led to place all analysis on a purely arithmetic foundation. His name has been a synonym of mathematical rigor for fifty years. There has now arisen a school inaugurated by Kronecker and continued in one form or another by Poincaré, Borel, Weyl and Brouwer, who call themselves finitists, empiricists or intuitionists. These aim to introduce a far more exalted type of rigor than has hitherto been deemed necessary, which if carried through will require a rebuilding of present analysis from the ground up. This movement is hotly challenged by the formalist school, whose protagonist is Hilbert. Time alone will settle the controversy. This address is to be published in the *Bulletin of the American Mathematical Society*.—The fifth Josiah Willard Gibbs lecture of the American Mathematical Society, on "Resonance in the Solar System," was delivered at the general session Wednesday afternoon, by Professor E. W. Brown, of Yale University. The lecturer developed certain consequences of resonance phenomena amongst the periods of revolution of planets and satellites. By means of the analogy to the motion of a frictionless pendulum under a periodic disturbance, the indeterminate nature of the problem of three or more bodies over long periods of time was emphasized. Two principal conclusions were drawn: (1) that any actual system like the solar system was in a continual state of development, owing to gravita-

tional action alone; (2) that speculations into the remote past or remote future of such a system were more likely to be valid if reached by probability methods than if attempted by exact analysis. The address will appear in the *Bulletin of the American Mathematical Society*. The society elected Professor J. W. Young, of Dartmouth College, and Professor H. L. Rietz, of the University of Iowa, as vice-presidents for two years. Professor J. L. Coolidge, of Harvard University, was appointed to represent the society in the National Research Council for three years from July 1, 1928.

The Mathematical Association of America held its twelfth annual meeting on Friday morning and afternoon, when seven papers were presented. President Ford presided. The following elections were announced: Professor A. J. Kempner, of the University of Colorado, and Professor F. D. Murnaghan, of the Johns Hopkins University, as vice-presidents for one year; Professors Archibald, Eisenhart, Lane and Rietz, as trustees for a term of three years.—On Thursday a very successful dinner for the mathematicians was held at the Ward-Belmont School.

SECTION B (PHYSICS)

Vice-president and chairman, A. H. Compton; retiring vice-president, W. Duane; secretary, A. L. Hughes, Washington University, St. Louis, Mo. With Section B met the American Physical Society (president, K. T. Compton; secretary, H. W. Webb, Columbia University, New York City) and the American Meteorological Society (president, C. F. Marvin; secretary, Charles F. Brooks, Clark University, Worcester, Mass.).

(Reports from A. L. Hughes and Charles F. Brooks)

Section B and the American Physical Society held meetings on Wednesday, Thursday and Friday. Nearly one hundred members of the section attended the meetings. The address of the retiring vice-president, Professor W. Duane, of Harvard University, was given on Wednesday afternoon, on "The General Radiation." Beginning with a rapid recapitulation of the main facts known about the general radiation in X-rays, the speaker pointed out how some of them receive a natural theoretical interpretation while others can not as yet be accounted for on any theory. He then went on to describe his investigations on the general radiation from matter in the gaseous state. Professor Duane finds that the distribution of the general radiation from a gas differs considerably from that from a solid in that the energy is more concentrated towards the short wave-length limit. Theory has at present no explanation to offer for this result. Pro-

essor Duane's address will be published later in SCIENCE. The address of the retiring vice-president was followed by a lecture by Dr. C. J. Davisson, of the Bell Telephone Laboratories, on "Diffraction of Electrons by a Crystal of Nickel." One of the most perplexing phenomena in physics is that radiation in some effects behaves exactly as though it were waves in a continuous medium, while in others it behaves like a torrent of tiny particles traveling with the velocity of light. Hitherto, the electron has been satisfactorily accounted for by supposing it to be a tiny material particle. Dr. Davisson and Dr. Germer have found, however, that when electrons impinge on a suitable metallic crystal surface they reemerge in definite directions, exactly as though they were X-rays of proper wave-length falling on the crystal. This behavior can not be explained at all on the supposition that the electron is a tiny material particle. The great significance of these results is that they show, for the first time, that the electron behaves in some phenomena just like a wave, while in others, it behaves like a particle. These discoveries are to be regarded as among the most fundamental of recent years.

The American Physical Society had a program occupying five half days. Fifty-three papers were communicated. On Wednesday Professor K. T. Compton, president of the American Physical Society, gave the presidential address on "Recent Studies of Electrical Discharges in Gases." He described briefly the principal features of the electrical discharge in gases, outlined various theories which had been proposed and pointed out the difficulties which bar the way to the application of the theories to actual conditions, except in specially selected, simple cases. He then proceeded to describe recent advances in this field (many of which have come from Professor Compton's own laboratory) and showed how we have now a much improved understanding of the various types of discharge and of the causes of the transitions between them.—On Thursday evening a very successful dinner was held, attended by over one hundred persons. The Nashville meeting will be remembered with pleasure by all who attended because of the unusually excellent arrangements for the physicists at the Ward-Belmont College.

The American Meteorological Society joined with Section E (Geology and Geography) and the Association of American Geographers in a symposium on "Problems of the Mississippi River," which occurred Thursday morning. About 150 persons attended. Five of the eight papers were on meteorological subjects. Four Weather Bureau flood forecasters, Frankenfield, Williamson, Barron and Cline, presented the fundamentals of flood causation and flood

prediction in the Mississippi Valley, while Brooks, on behalf of Bangs and himself, gave a weather-map discussion of the great rainfall of April, 1927, to which was due the unusual magnitude of the recent flood. Special tribute was given to Dr. I. M. Cline, on account of his surpassing public service in the Louisiana region of the flood. The prime importance of the rainfall in the middle and lower parts of the Mississippi Basin and the relative insignificance of all other factors were emphasized and a plea was made for a thorough-going meteorological investigation of great rain periods and their antecedents.—A session was devoted to local climatological studies. Another was on winds. A third was largely on storms, but included papers on radio, and on the correlation periodogram.—Of special import to Tennessee was the Tennessee Weather Service session and luncheon on Friday, organized by Fergusson, Nunn and Williamson, all of them Tennessee meteorologists. A group of the cooperative observers of the state joined with many Weather Bureau officials and others to talk over affairs of mutual interest and the session was presided over by Professor C. F. Marvin, chief of the U. S. Weather Bureau and president of the American Meteorological Society. Mrs. Ross Woods, who maintains the long-record station at Palmetto, Tennessee, brilliantly addressed the group on "Duties and Experiences of a Cooperative Observer" and other observers spoke informally. The luncheon proved a most enjoyable occasion, with Roscoe Nunn as toastmaster.—William J. Humphreys was elected president and Edward Alden Beales vice-president for two years, while Willis Ray Gregg and Charles F. Brooks were continued as treasurer and secretary, respectively. The one-hundred-dollar prize of the Meisinger Aerological Research Fund was announced for award at the end of 1928. Resolutions were adopted (1) thanking the George Peabody College for Teachers for the excellent facilities of this meeting, (2) urging increased government appropriations for the *Monthly Weather Review* and (3) requesting an appropriation of \$25,000 from Congress for a special investigation of ocean meteorology in relation to floods in the Mississippi and other rivers.

SECTION C (CHEMISTRY)

Vice-president and chairman, Roger Adams; *retiring vice-president*, Lauder W. Jones; *secretary*, Gerhard Dietrichson, Massachusetts Institute of Technology, Cambridge, Mass.

(Report from Gerhard Dietrichson)

Section C held meetings on Tuesday, Wednesday and Thursday. On Wednesday morning it joined with Section N (Medical Sciences) in a symposium

on "Some Contributions of Other Sciences to Medicine," an account of which will be found in the report of Section N. Section C held four other sessions. Professor Lauder W. Jones, of Princeton University, delivered the retiring vice-presidential address Tuesday afternoon, on "A Glimpse at Chemistry Here and Abroad." Having traveled extensively throughout Europe during the past two years, Professor Jones discussed some interesting comparisons of post-war conditions. He stated that the situation in many of the university laboratories, especially outside of Germany, is still disappointing but that it is gradually improving. European research institutions are somewhat more favorably situated. In an address entitled "Valence and the Electronic Theory," Professor W. A. Noyes, of the University of Illinois, reviewed the historical development of valence conceptions, leading up to the modern electronic theory, discussing in this connection his own notable contributions in connection with nitrogen trichloride and hypochlorous acid. As a result of the illness of Dean James Kendall, of New York University, his paper on "Separations by the Ionic-Migration Method" was read by the secretary of the section. In this paper Dean Kendall first told about his attempted separation of isotopes, which has not yet been accomplished. The separation of the constituents of other mixtures has been very successful, however. Among these may be mentioned the rare earths, radium and barium, and the alkaloids. Professor Harry B. Weiser, of Rice Institute, presented a paper entitled "Ionic Antagonisms in Colloid Systems." Through a study of the precipitating action of various electrolytes on inorganic colloids such as arsenic trisulphide and copper ferrocyanide, Professor Weiser has attempted to formulate the mechanism of the antagonistic effect of salt pairs. On the basis of his formulations he has proposed an explanation of the permeability of cell membranes. There were eleven shorter papers, some by members of the Vanderbilt University Medical School. These papers, as well as those presented at the joint session, showed clearly the increasingly close relation between some phases of medical and chemical research.

SECTION D (ASTRONOMY)

Vice-president and chairman, Walter A. Adams; retiring vice-president, Robert G. Aitken; secretary, Philip Fox, Northwestern University, Evanston, Ill.

(Report from Philip Fox)

The American Astronomical Society did not meet with Section D this year, and the attendance at the section session was therefore small. Two very suc-

cessful sessions were held, however, one jointly with the Tennessee Academy of Science, and the general session of Wednesday evening was arranged by Section D. A report on the preparation of the extension of Burnham's Catalogue of Double Stars was given by Robert G. Aitken. The speaker outlined the form the publication will take, showing sample pages. The manuscript is ready through eight hours of right ascension and funds are available for printing as soon as the work is finished. Dinsmore Alter gave results of the application of correlation periodogram to the analysis of sun-spot data, expressing some doubt of the existence of a true period, but stating that, if such exists, 11.46 years seems to represent it most closely. C. T. Elvey compared the relative intensities of the Green Nebular Lines N_1 and N_2 , finding that the intensity ratio of N_1 to N_2 was equal to 2.76, for the cases studied. R. H. Curtiss reported on the Lamont expedition to South Africa. He stated that the Blömfontein station would be ready to start the double star survey on the southern sky early in January. It is with deep regret that we realize that death interceded to prevent Professor W. J. Hussey from completing this great work, which he so effectively planned. A second paper by R. H. Curtiss was a review of the early years of stellar spectroscopy and the growth of the idea of spectral classification. The final paper, by C. C. Wylie, gave an illustrated account of the circumstances connected with the fall and finding of the Tilden Meteorite. (See SCIENCE, November 11, 1927, p. 451.)—The Wednesday afternoon session, held with the Tennessee Academy of Science, was commemorative of Edward Emerson Barnard, perhaps the most illustrious man of science native of Nashville. (See report of Tennessee Academy, in this issue of SCIENCE.)—At the general session Wednesday evening was delivered the address of the retiring vice-president of Section D, on "Edward Emerson Barnard, His Life and Works," by Robert G. Aitken.

SECTION E (GEOLOGY AND GEOGRAPHY)

Vice-president and Chairman, Charles Schuchert; secretary, G. R. Mansfield, U. S. Geological Survey, Washington, D. C. With the section met the Association of American Geographers (president, M. R. Campbell; secretary, Charles C. Colby, University of Chicago), and the National Council of Geography Teachers (president, R. G. Buzzard; secretary, George J. Miller, State Teachers College, Mankato, Minn.)

(Reports from G. R. Mansfield, Charles C. Colby and George J. Miller)

Although the Geological Society of America met at

Cleveland this year, yet the Nashville meeting of Section E brought together an interested group of about forty. A number in attendance at Nashville went later to the Cleveland meeting. Section E joined with the Association of American Geographers in a dinner Wednesday evening and with the American Meteorological Society and the Association of American Geographers in a session Thursday morning. Independent sessions of Section E were held Tuesday morning and afternoon and Wednesday morning. Nineteen papers were presented. Tuesday, the principal day of the meeting, was devoted to a symposium on the Mesozoic-Cenozoic stratigraphy of the Gulf States. At the morning session six state geologists displayed maps of their respective states and described the formations of Mesozoic and Cenozoic age. Professor Charles Schuchert, who presided, gave a paper on the paleogeography of North America during the Triassic and Jurassic, which served as a setting for the afternoon papers. L. W. Stephenson gave two papers, both of which were notable for their clarity and able presentation. The first served as an introduction to the paleontologic group and dealt with the major marine transgressions and regressions and with the structural features of the coastal plain. The second described the Upper Cretaceous or Gulf series and was illustrated by an elaborate correlation chart. A paper by F. B. Plummer and H. J. Plummer on the Midway correlations on the basis of the foraminifera was also noteworthy. It showed how serviceable a close and detailed study of these minute forms may prove in the identification of certain strata or horizons. On Tuesday evening a smoker was held at which the maps used during the symposium were on display and served as the basis of protracted and animated discussion. At the session Wednesday morning Austin F. Rogers contributed a noteworthy mineralogical study of the origin of the brown rock phosphate of Tennessee. C. Wythe Cook showed that the Horners-town (greensand) marl and the Vincentown sand of New Jersey, long considered as belonging to the Upper Cretaceous, are really of Eocene age. G. R. Mansfield summarized the results of a long program of research by members of the U. S. Geological Survey in the Rocky Mountains of southeastern Idaho. At the joint dinner Wednesday evening Dr. G. H. Ashley delivered the address of the retiring vice-president for Section E, on "Geology and the World at Large." This paper was published in SCIENCE for January 13.

The Association of American Geographers held sessions from Wednesday to Saturday. A most successful feature of this meeting was the field trip on

Friday, a field study of the Highland Plain and the Cumberland Plateau, of the Nashville Basin. Each of the two communities studied was traversed by a well-chosen route, by means of automobile buses. A mimeographed log showing the principal characteristics of each area helped very greatly in promoting discussion.—The Association of Geographers joined Section E and the Meteorological Society in a joint symposium Thursday morning, on "Problems of the Mississippi River." The meteorological conditions that cause floods in the river and the régime of the river during last spring's floods were treated in a series of scholarly papers by H. C. Frankenfield, R. M. Williamson, and W. E. Barron (all of the U. S. Weather Bureau), and C. F. Brooks, of Clark University. I. M. Cline, of the New Orleans station of the U. S. Weather Bureau, showed that the floods of last spring were predicted well in advance of their occurrence. William H. Haas, of Northwestern University, pointed out that any lengthening by the enlargement of meanders or by the extension of the "passes" into the Gulf would consequently result in a new and higher base level being imposed on the old, and the levees would have to be raised from time to time indefinitely. Conversely, any shortening of the route by which the river reaches the gulf would automatically bring on a new adjustment, with base level lower than the present, which would practically eliminate the necessity of further levee construction.

The five regular half-day sessions were notable for the general excellence of the papers and for active and discriminating discussion. Taken as an inventory of the trend and progress of American productive scholarship in geography, the papers given at Nashville show that the wave of interest in detailed, quantitative studies of small areas, which appeared a few years ago, is bringing highly meritorious results, and that rapid progress is being made in method and technique, both as to performance in the field and in the presentation of the results of field work. A paper by Preston E. James, of the University of Michigan, on "The Blackstone Valley of Massachusetts and Rhode Island," was particularly noteworthy for the effectiveness of its technique; the paper by Robert S. Platt, of the University of Chicago, on "A Field Study of an Iron Range Community: Republic, Michigan," was remarkable for its closely knit organization; and the contribution of Glenn T. Trewartha, fellow of the Guggenheim Foundation, on "A Regional Study in Eastern Shizuoka Prefecture, Japan," illustrated very well how technique and method devised for work in this country may be efficiently employed in a land where the language barrier presents maximum difficulty. Further evidence of current interest in the study of unit areas was furnished by a

report of progress on an experiment in cooperative field work being made by Wallace W. Atwood, W. Elmer Ekblaw, Clarence F. Jones and Charles F. Brooks, all of Clark University.—As in recent years the Association of Geographers joined Section E at the dinner for geologists and geographers. On that occasion was given the retiring vice-presidential address for Section E, by G. H. Ashley, on "Geology and the World at Large," and the presidential address for the Association of American Geographers, by M. R. Campbell, on "Geographic Terminology." Dr. Ashley's address has appeared in SCIENCE for January 13, 1928.

The Nashville meeting was unusually pleasant. The members were lodged in the comfortable dormitories of the George Peabody College for Teachers and the college cafeteria was kept open for their use. The sessions were held in the Social Religious Building of that institution and each afternoon those in attendance were the guests at tea of the department of geography.—The officers for 1928 are: *President*, Douglas W. Johnson, Columbia University; *vice-president*, W. L. G. Joerg, American Geographical Society; *secretary*, Chas. C. Colby, University of Chicago; *treasurer*, V. C. Finch, University of Wisconsin.

The National Council of Geography Teachers met on Tuesday and Wednesday, with a program that presented two distinctive features in the field of educational geography. Organizing geographical courses in teacher-training institutions was the theme of the first session, with special reference to the problem of giving adequate training in subject-matter, at the same time retaining a professional viewpoint. A summary of this important discussion will appear in the *Journal of Geography*. Another important topic was the significance of field studies in teacher training. The presidential address, by R. G. Buzzard, of the Illinois State Normal University, Normal, Ill., dealt with this phase of the work. Systematic field study is now being done in a number of the teachers' colleges of the country and plans for expansion are being matured. Mr. L. O. Packard, of the Teachers College of the City of Boston, was elected president for the ensuing year.

SECTION F (ZOOLOGICAL SCIENCES)

Vice-president and chairman, C. E. McClung; *retiring vice-president*, Winterton C. Curtis; *secretary*, Geo. T. Hargitt, Syracuse University, Syracuse, N. Y. The following-named organizations met with the section: The American Society of Zoologists (*president*, S. J. Holmes; *secretary*, D. E. Minnich, University of Minnesota, Minneapolis, Minn.), the Entomological

Society of America (*president*, F. E. Lutz; *secretary*, J. J. Davis, Purdue University, Lafayette, Ind.), the American Association of Economic Entomologists (*president*, R. W. Harned; *secretary*, C. W. Collins, Melrose Highlands, Mass.), the American Society of Parasitologists (*president*, R. P. Strong; *secretary*, W. W. Cort, the Johns Hopkins University, School of Hygiene and Public Health, Baltimore, Md.) and the Wilson Ornithological Club (*president*, Lynds Jones; *secretary*, Howard K. Gloyd, Kansas State College, Manhattan, Kan.).

(*Reports from Geo. T. Hargitt, D. E. Minnich, J. J. Davis, C. W. Collins and W. W. Cort*)

A very successful and enthusiastic meeting of the many groups of zoologists associated with Section F was held at Nashville. The sessions were in rooms of the new Medical School of Vanderbilt University and thanks are due those who made the very satisfactory arrangements, as well as to the Medical School. Many papers were presented by informal demonstration rather than by formal reading, a method which added greatly to the interest and value of the contributions. All papers contributed by members of Section F were placed in the program of the American Society of Zoologists. Professor Winterton C. Curtis, of the University of Missouri, the retiring vice-president for the section, gave his retiring vice-presidential address, entitled "Old Problems and a New Technique," at the zoological dinner Thursday evening. He reviewed the older methods of investigation and pointed out their advantages and limitations. He then outlined the newer method and technique of irradiation by X-rays, showing the delicacy and specificity of this technique. The opinion was expressed that this newer approach offered a far more delicate method for the analysis of biological factors and a more promising field of experimentation than are offered by any of the older methods. This interesting and valuable address is to be printed in SCIENCE.

The American Society of Zoologists held sessions for the formal reading of papers on Wednesday, Thursday and Friday mornings and Thursday afternoon. Forty-five papers were read, exclusive of those on joint programs. These were distributed as follows: general and comparative physiology, 30; protozoology, 2; comparative anatomy, 4; cytology, 4; embryology, 5. The sessions were well attended, the attendance frequently running well over one hundred. On Wednesday afternoon the program was given over to informal demonstrations and exhibits, about thirty papers being presented in this manner. This session was particularly successful, as attested by large attendance and enthusiastic comments. On Wednesday

evening a large group attended the Biological Smoker, which was held in the Alumni Memorial Building of Vanderbilt University. The program closed at noon on Friday.

The Entomological Society of America held its twenty-second annual meeting on Tuesday and Wednesday, twenty-five unusually interesting papers being presented. One afternoon was devoted to an interesting symposium on "The Physiology of Insects." The papers on the general program dealt with every phase of entomology. R. H. Painter, of Kansas State Agricultural College, gave the results of a study of the method and nature of chinch bug feeding punctures and showed the relation of this study to the problem of resistant and susceptible varieties of plants. T. J. Headlee, of the New Jersey Agricultural Experiment Station, showed the practical possibilities of using the thermal constant in timing spray treatments for the codling moth. R. W. Leiby, of the North Carolina State Department of Agriculture, reported the structure of the intestine of the cotton boll-weevil and the abnormal pathology of cells of the intestine following feeding upon cotton foliage dusted with calcium arsenate. C. H. Kennedy, of Ohio State University, gave interesting results of a study of the origin and dispersal of the strong-flying, river dragon-flies (*Macromia*), presenting evidence that these dragon-flies originate in the Mississippi Valley and spread through Alaska and into Asia, Europe, Australia and South Africa.—The annual public address of the society was given this year by Dr. H. T. Fernald, of Massachusetts Agricultural College, on "Insects, the People and the State." The meetings were well attended, with from sixty to one hundred or more present at each session. Officers for the coming year were elected as follows: *President*, E. O. Essig; *secretary-treasurer*, J. J. Davis, Purdue University, Lafayette, Indiana.

The American Association of Economic Entomologists met from Tuesday to Friday, attendance being unexpectedly good, with more than two hundred present.—At the meeting of the Section of Plant Quarantine and Inspection (*chairman*, J. H. Montgomery; *secretary*, W. B. Wood) S. B. Fracker, of Washington, D. C., acted as secretary in the absence of Mr. Wood. In his address as chairman, J. H. Montgomery emphasized the importance of quarantine activities. Reports of the Central, Southern and Western Plant Boards and of the National Plant Board showed these organizations to be functioning in the direction of increased efficiency and uniformity. Introducing a symposium on the activities of the Federal Horticultural Board, Dr. C. L. Marlatt described "Recent Developments in Federal Plant Quarantine Work," emphasizing the control operations

against the Mexican fruit-worm and the cotton pink-bollworm. Other papers dealt with the pink-bollworm and the *Thurberia* weevil, *Narcissus* inspection, the Mexican fruitworm, Pacific port inspection and pear-blight eradication. After a round-table discussion, during which developments in the Japanese-beetle and gipsy-moth problems were discussed informally, L. S. McLaine was elected chairman and S. B. Fracker secretary for 1928.—The Section of Apiculture (*chairman*, F. E. Millen; *secretary*, G. M. Bentley, Knoxville, Tenn.) held its session Tuesday afternoon and evening. No session of this section has ever been more successful in either interest or attendance. The chairman of this section for 1928 is H. F. Wilson and E. N. Cory (College Park, Md.) is secretary.—The Cotton States Branch held a joint session with the main organization Thursday afternoon, at which papers dealing with entomological problems in the South, including those related to the cotton boll-weevil, were presented. The general program opened Wednesday afternoon, with a business session. Reports of various committees were read, these being followed by the address of President R. W. Harned, entitled "Entomology in the Southern States." The speaker gave a most interesting compilation of the development of entomology in the South, showing that interest in entomology in those states ranks almost as high as California and some of the more populous Eastern states. There were six papers on the European corn-borer, which attracted much attention, with lively discussion following their presentation. There was a symposium on insecticides, where four entomologists reviewed briefly the development in this field to date. Nine papers under the heading "Insecticides and Appliances" were read, which covered in a large measure the interesting developments of the past year in this field. Two outstanding papers were presented at this session on "The Preparation of a Special Light Sodium Fluosilicate" and on "The Preparation of Special Calcium Arsenates containing less than 40 per cent. of Arsenic as As_2O_5 ," and the uses of these materials as boll-weevil poisons, by Captain H. W. Walker, of the Chemical Warfare Service. There were discussions of entomological problems related to truck, cereal, forage and field crops, forest and shade trees and ornamental plants, deciduous fruits, bulbs, greenhouse crops and tropical and sub-tropical plants. New data were presented on the codling moth. On Wednesday evening the seventh annual entomologists' dinner was held in honor of Dr. L. O. Howard, for thirty-three years chief of the U. S. Bureau of Entomology. Two hundred and forty-nine members and guests attended this dinner. Dr. H. A. Morgan, president of the University of Tennessee, acted as toastmaster. The

occasion was one of the most pleasing that the Entomological Association has enjoyed at its annual conventions. Dr. C. L. Marlatt, the present chief of the U. S. Bureau of Entomology, paid tribute to the work of Dr. Howard and Dr. Howard responded in a most fitting manner, also showing many slides and giving sidelights on his contacts with European entomologists. Dr. F. E. Lutz spoke on "Unapplied Entomology." Entertainment was furnished by local talent. The Extension Entomologists and Insect Pest Survey held a meeting Tuesday evening at the Hotel Hermitage, which was well attended. Professor W. B. Herms, of the University of California, was elected president; J. E. Graf, of the U. S. Bureau of Entomology, was elected vice-president and C. W. Collins (Melrose Highlands, Mass.) continues as secretary of the association.

The American Society of Parasitologists held its third annual meeting from Tuesday to Friday, with about fifty members present. One of the outstanding features of the program was the address of the retiring president, Dr. R. P. Strong, entitled "Some Parasitic Infections Observed in Equatorial Africa during 1926 and 1927." Dr. Strong gave a survey of some of the findings of his African expedition. In addition to the contributed papers, a symposium on the teaching of parasitology and a program of invited papers on medical parasitology were held. Great interest in teaching problems was in evidence. The discussion brought out the fact that one of the greatest needs of teachers of this subject is more adequate information on methods of obtaining material, and a very large number of practical suggestions along this line were brought out both in the papers themselves and in the discussion.

The invited papers on medical parasitology were of unusual interest. J. F. Kessel reported experiments in which he was able to infect various animals with certain of the intestinal protozoa of man, and suggested that host specificity is not as rigid in many parasitic protozoa as has been usually believed. P. D. Lamson, of the Medical School of Vanderbilt University, summed up the recent advances made by his group on carbon-tetrachloride poisoning, including the extremely important finding that the toxicity of this drug is related in a definite way to calcium deficiency. A. C. Chandler gave an illuminating analysis of the methods and results of his recent epidemiologic studies on hookworm disease in India, in which it has been shown that in only a few places is the intensity of the infestation with hookworm sufficient to make this disease a real public-health problem.

For the first time a number of the papers on the contributed program were presented by demonstra-

tions, which proved to be very successful. An extensive demonstration on creeping eruption, a disease produced by the wanderings of the larvae of the canine hookworm (*Ancylostoma braziliensis*) in the human skin, was given by W. E. Dove and attracted a great deal of attention. The demonstration period gave an opportunity for a social hour, at which tea was served. A total of forty-five contributed papers were listed on the program, fourteen in protozoology, twenty-three in helminthology, four in medical entomology and four in general parasitology. More than half of the papers were related to parasites of man or of domesticated animals. An unusually large number of interesting and important contributions were made, only a very few of which can be mentioned here. There were three papers by G. W. Hunter, L. J. Thomas and H. E. Essex, respectively, which gave important new light on tapeworm life cycles. In two papers L. R. Cleveland first showed how to separate a trichinomonas of man from bacteria and then gave results of experiments on its growth in pure cultures of various microorganisms. These studies appear to open up a new field of possibilities in cultural studies of parasitic protozoa. In a very interesting and challenging paper on "The Economic Importance of Veterinary Parasitology," M. C. Hall pointed out how tremendous is the economic loss due to parasites of domesticated animals. Abstracts of the contributed papers appeared in the December number of the *Journal of Parasitology*, sent to all the members of the society. The following officers were elected for 1928: *President*, C. A. Kofoid; *vice-president*, R. W. Hegner; *secretary-treasurer*, W. W. Cort.

The Wilson Ornithological Club met with the section, but no report of its sessions has been received.

SECTION G (BOTANICAL SCIENCES)

Vice-president and chairman, William Crocker; *retiring vice-president*, Benjamin M. Duggar; *secretary*, Sam F. Trelease, Columbia University, New York City. The following named organizations met with the section: The Botanical Society of America (*president*, H. H. Bartlett; *secretary*, Arthur J. Eames, Cornell University, Ithaca, N. Y.), the American Phytopathological Society (*president*, M. F. Barrus; *secretary*, R. J. Haskell, U. S. Bureau of Plant Industry, Washington, D. C.) and the American Society of Plant Physiologists (*president*, Charles A. Shull; *secretary*, Scott V. Eaton, University of Chicago, Chicago, Ill.).

(*Reports from Sam F. Trelease, Arthur J. Eames, Paul B. Sears, C. W. Dodge, S. C. Brooks, F. J. Schneiderhan, J. F. Adams and Scott V. Eaton*)

As in recent years, Section G arranged a single ses-

sion of invited papers of general interest, held jointly with its constituent societies on Wednesday afternoon. Dr. B. M. Duggar gave the vice-presidential address on "Recent Viewpoints and Evidence tending to characterize the Agencies of Typical Mosaics." Dr. Chas. F. Hottes spoke on "Chromidia in Plant Cells." (These are fragments of chromatin lying freely in the cell, not massed into a nucleus.) Dr. W. W. Lepeschkin read a paper on "The Effect of Alcohol on the Turgor Pressure of Spirogyra." Dr. E. C. Stakman spoke on "Epidemiology of *Puccinia graminis*." Dr. A. B. Stout read an address on "Dichogamy in Flowering Plants." These were all very valuable contributions, but inadequate space prevents giving more than their titles here.

The Botanical Society of America, with a registered attendance of 218, held a successful meeting from December 27 to 31. The usual dinner for all botanists was held jointly with the American Society of Naturalists. The retiring president of the Botanical Society, L. H. Bailey, was unfortunately prevented by illness from delivering the presidential address, and President H. H. Bartlett related some of his experiences while living and collecting in Sumatra during the past year. President-Elect A. H. R. Buller spoke briefly.—Officers of the Botanical Society were elected as follows: *President*, A. H. Reginald Buller; *vice-president*, Irving W. Bailey; *council representatives*, H. H. Bartlett and I. F. Lewis; *corresponding members*, Abbé G. Bresadola, S. Ikeno, C. H. Ostenfeld, O. Rosenberg and R. von Wettstein. The following paragraphs summarize the reports of the four sections of the Botanical Society:

The General Section (*chairman*, G. P. Burns; *secretary*, Paul B. Sears) met on Wednesday, Thursday and Friday, with well-attended sessions and a program of twenty-six papers. Researches were reported in both descriptive and experimental morphology, and in cytology, genetics, physiology, paleobotany, taxonomy, ecology and technique. One session was devoted to a discussion of the teaching of botany. Of outstanding interest was the presentation of points of view that are being developed in the teaching of general botany at Chicago, Missouri and Wellesley. Gilbert M. Smith was elected *chairman*, and Paul B. Sears, *secretary* for the ensuing year.

The Mycological Section (*chairman*, W. C. Coker; *secretary*, C. W. Dodge) held two sessions with papers on cytological, morphological and physiological researches on fungi. The first session was devoted to general papers and phyciomycetes. C. L. Porter reported on the effect of varying hydrogen-ion concentration and temperature upon a large number of pathogenic fungi. W. C. Coker discussed the occurrence of a large number of water-moulds in the soil. At

the second session, W. J. Bach and F. A. Wolf discussed the cause of Citrus melanose. H. H. Whetzel discussed in great detail the relationships between fungi of the *Botrytis cinerea* group and Sclerotinia. C. W. Dodge discussed the morphology, phylogeny and taxonomy of the higher Plectascales. Structures resembling sexual organs were reported for Mesophelia and the systematic position of this genus was definitely determined as in the Ascomycetes instead of the Basidiomycetes. J. N. Couch discussed the structure and development of tropical species of Septobasidium, reporting germination of basidiospores.—At the joint session of the Mycological Section of the Botanical Society with the American Phytopathological Society, A. H. R. Buller discussed the growth of the mycelium of *Armillaria mellea* in relation to luminosity. J. H. Craigie reported an investigation upon sex in the rusts, in which it was found that *Puccinia graminis* is heterothallic. (See report of Phytopathological Society, below.) J. J. Taubenhaus and L. J. Pessin discussed the hydrogen-ion toleration of *Phymatotrichum omnivorum* in relation to possible control of this disease. B. O. Dodge reported on the morphology and cytology of fertile hybrid perithecia from crossing *Neurospora sitophila* and *N. tetrasperma*.

The Physiological Section (*chairman*, C. O. Appleman; *secretary-treasurer*, S. C. Brooks) held three scientific sessions, of which one was a round-table discussion on "Mineral Nutrition," and two were for the reading of twenty-five original papers. Paper mulch, by maintaining superior soil conditions and controlling weeds, will perhaps lead to radical changes in truck-crop cultivation. Lewis H. Flint reported on several years of field trials of paper mulch, with gratifying increases in yield. Adelia McCrea reported significant increases in both yield and drug potency of *Digitalis purpurea*, which in the seed bed had been grown under a special glass transmitting sunlight ultra-violet. Eloise Gerry described the effects of fire on wood structure and on yield of resin in long-leaf pine and also reported preliminary studies on the production of heptane by *Pinus Jeffreyi*.—On the theoretical side, a paper by D. T. MacDougal, J. B. Overton and G. M. Smith presented evidence for the existence in woody stems of continuous vascular air connections, and provoked much discussion of both methods and conclusions. The discussion was further stimulated by A. F. Hemenway's paper on the rate of sap flow in desert plants, as measured by the spread of introduced dyes. O. L. Sponsler and W. H. Dore explained, with the aid of space models, the arrangement of atoms and molecules in ramie cellulose, and the train of argument by which the structure of the individual C₆ units and their relative positions were de-

duced. W. E. Burge and collaborators showed that the intake of dextrose, levulose and galactose by *Spirogyra* is parallel to the utilization of these substances by *Paramoecium* and higher animals, in that it is increased by insulin and by optically active as opposed to optically inactive amino-acids.—The round-table discussion of mineral nutrition was introduced by D. R. Hoagland, and various phases of the subject were treated by J. S. McHargue, E. S. Johnston, F. W. Parker, W. J. Robbins, W. E. Tottingham and S. C. Brooks. Spirited discussion ensued, centering particularly about the effects of boron, the effects of light and the definition of terms.

The Systematic Section (*chairman*, C. C. Deam; *secretary*, F. T. McFarland) held two sessions. The Wednesday morning session was given over to the reading of six papers dealing with problems of classification, distribution and education in taxonomy. The Thursday morning session was taken up by an informal discussion of the flora of the Mississippi Valley.

The American Phytopathological Society held its eighteenth annual meeting from Tuesday to Friday. The attendance was about 175 and the arrangements were the best in recent years. It was generally remarked that the small daylight screen used this year for slide projection was quite unsatisfactory to a large part of the audience; larger screens are greatly needed.—Sixty-five new members were added to the roll, the total membership being now 750. Officers for 1928 were elected as follows: *President*, H. P. Barss; *vice-president*, F. D. Heald; *councilor*, F. D. Fromme.—The program contained ninety papers, twenty-nine more than last year's program. Four were given in joint session with Section G and twelve with the Mycological Section of the Botanical Society. The remaining papers may be classified according to subjects, as follows: crown gall, 10; potato and vegetable diseases, 11; cereal and forage diseases, 11; fruit diseases, 9; tobacco diseases, 8; mosaic diseases, 8; diseases of ornamentals, 7; sweet-potato diseases, 3, and miscellaneous papers given before the Southern Division of the Society, 7.—The dinner was attended by 169 persons. The principal speaker was Watson Davis, of Science Service. A quartette of typical Tennessee darkies crooned soft southern melodies and negro spirituals in a most effective manner, giving a background of unflagging interest. The reincarnation of Charles Darwin, in the person of F. D. Fromme, in a haunted atmosphere with a metaphysical accent, was another feature of the dinner. The dinner program was shorter and better than usual, an innovation that was greatly approved.

The causes and control of overgrowths and hairy root in nursery stock were dealt with by seven speakers. Wound overgrowth and crown gall of apple oc-

curred in England, France and Holland were reported on by A. J. Riker.—Francis O. Holmes discussed technique for comparing various concentrations of tobacco-mosaic virus.—The importance of strict sanitation in propagating tobacco, for the control of true tobacco mosaic, was emphasized by W. D. Valleau and E. M. Johnson.—Tobacco ringspot was shown to be a virus capable of infecting a wide range of plants, by S. A. Wingard and F. D. Fromme, who succeeded in infecting plants of nineteen genera, representing eleven families.—Treating undelinted cotton seed with fungicidal dusts was reported to be economical by N. C. Woodroof.—C. R. Orton discussed the effect of disinfectants on the germination of seeds kept in storage for indefinite periods, reporting that the organic mercury dusts did not decrease germination, but increased it in many cases after storage periods of from one to three years.—The effectiveness of organic and inorganic mercury compounds for the control of large and small brown-patch of turf have again been confirmed by the studies of John Monteith, Jr., and A. S. Dahl.—New physiologic forms of *Tilletia tritici* may be the explanation for the gradual increase of the wheat disease in America, especially in Kansas, Virginia and Pennsylvania, according to E. G. Gaines.—Two new dust treatments for oat smuts were reported by J. D. Sayre and R. C. Thomas. The fungicidal base used was formaldehyde and iodine.—J. Johnson found that the properties of the potato rugose-mosaic virus are quite different from those of certain other potato viruses studied, such as leaf-rolling mosaic and spot necrosis.—S. P. Doolittle and M. N. Walker presented evidence to show that the aphis transmission of cucumber mosaic results from the virus being carried into the plant tissues on the proboscis of the insect and that the minute amount of the virus thus carried is exhausted during the first feeding period.—Further studies on the black root-rot of apple caused by *Xylaria mali* nom. nov., show that the fungus is also actively parasitic on Norway maple and Mahaleb cherry.—E. E. Wilson presented data which further emphasize the relationships of the time of leaf-fall to the maturity of ascospores of *Venturia inaequalis*. Additional studies on certain phases of this important apple disease were presented by G. W. Keitt with E. E. Wilson and J. M. Hamilton.—The toxic constituent of sulphur fungicides, according to H. C. Young and Robert Williams, is pentathionic acid. When sulphur was freed of its pentathionic acid and then placed in Van Tieghem cells it was not toxic to spores of *Sclerotinia cinerea*. A simple test for pentathionic acid was described.

Probably the most noteworthy contribution of the meeting was a paper by J. H. Craigie on the heterothallism of the rust fungi. Investigations of sex in

these fungi have shown that *Puccinia graminis* and *P. helianthi* are heterothallic. The sporidia are of two kinds, designated plus and minus. A plus sporidium gives rise to a plus mycelium and a set of pycnia that produce plus pycnospores. A minus sporidium gives rise to a minus mycelium and a set of pycnia that produce minus pycnospores. When a plus and a minus sporidium are sown close together on a leaf, the plus and minus mycelia resulting therefrom intermingle and produce diploid aecia. When plus pycnospores are brought into contact with a minus pycnium, or minus pycnospores with a plus pycnium, diploid aecia are produced, within a few days of transfer, on the under side of the pustule receiving the pycnospores. The pycnium is to be regarded not as a spermagonium, producing non-functional spermatia, but as an active organ which develops either plus or minus pycnospores and attracts flies, by means of which pycnospores of one sex are carried to pycnia of another sex.

The American Society of Plant Physiologists met from December 27 to 30. A dinner for all plant physiologists was held Wednesday evening, at the Chamber of Commerce, in commemoration of the 250th anniversary of the birth of Stephen Hales. President Charles A. Shull delivered a very interesting address at that time, on the life and work of Hales, with illustrations by means of lantern slides taken from Hales's famous book, "Vegetable Staticks." Dr. Burton E. Livingston followed with an address announcing the establishment of the Stephen Hales Prize Fund by the society. He emphasized the importance of this, the first fund to be established for a prize in plant physiology. The first award of the Stephen Hales Prize is to be made at the New York meeting next December. Finally, the election of the second Charles Reid Barnes Life Member of the American Society of Plant Physiologists was announced by Professor F. M. Andrews, chairman of the committee on that honorary membership. This honor is conferred for outstanding research in plant physiology. It was this year conferred on Professor F. E. Lloyd, of McGill University, Montreal.—Reports of committees at the business meetings indicated encouraging progress in many directions. President Shull called attention to the present excellent financial condition of *Plant Physiology* (the official journal of the society), which is already established as successful in every way. A unanimous vote of thanks was extended by the society to President Shull for his indefatigable efforts on behalf of the society since its organization. Dr. S. V. Eaton, secretary of the society, reported a large increase in membership during the year.—For the first time, arrangements were successfully made this year by which

conflicts were completely avoided between the sessions of the Society of Plant Physiologists and those of the Physiological Section of the Botanical Society, to the great gratification of all.

The papers presented at Nashville were varied and generally of great excellence. F. M. Andrews, of Indiana University, described the opening of crocus and tulip flowers in response to temperature increase of a single degree or less.—W. E. Tottingham and H. Lowsma, of the University of Wisconsin, reported that chemical analyses of wheat plants, grown respectively in red-yellow, green-violet and ultra-violet light, showed highest nitrate assimilation and protein synthesis in the green-violet region.—Charles A. Shull, of the University of Chicago, described a quantitative study of the reflection of light from leaf surfaces. Reflection was found to be most complete for green light and low for red and blue light.—J. D. Sayre, of Ohio State University, found that light of wave-length greater than $680 \mu\mu$ was ineffective in chlorophyll formation in many species of crop plants.—D. R. Hoagland, A. R. Davis and P. L. Hibbard, of the University of California, discussed the influence of one ion on the absorption of another by Nitella in dilute solutions.—S. Dunn and A. L. Bakke, of Iowa State College, showed that the amount of dye taken up by the wood of different species could not generally be directly correlated with their known hardiness.

The joint session of the society with Section G and the other affiliated societies is reported elsewhere. The valuable and spirited discussion before the Physiological Section of the Botanical Society on Thursday morning, on the mineral nutrition of plants, was followed in the afternoon by an equally interesting symposium before the Society of Plant Physiologists, on "What Needs to be Done Next in Plant Physiology?" C. B. Lipman, of the University of California, in a paper read by D. R. Hoagland, emphasized, among other things, a need for reform in the teaching of botany in laboratory and classroom. B. E. Livingston, of the Johns Hopkins University, drew attention to the present need for studies on the plant as a whole, especially in relation to its environment, and the need for further data on the interrelation of influential conditions, their mutual effects and their ranges of influence. D. T. MacDougal, of the Carnegie Institution of Washington, emphasized the great present need for work on photosynthesis, permeability, the dynamics of colloids and environmental influences on growth. E. J. Kraus, of the University of Chicago, urged that more attempts be made to correlate as yet isolated biological phenomena and pleaded for greater mutual understanding among physiological workers as well as for unremitting efforts in all phases of research.

At the final session on Friday morning occurred the first public showing of a motion-picture film on the "Physiology of Gametes in the Conjugatae," by F. E. Lloyd, of McGill University. This film vividly portrayed great activity in the protoplasm of conjugating cells and demonstrated the importance of vacuoles in the process.—A. R. Davis and D. R. Hoagland, of the University of California, described a simple apparatus for controlling the atmospheric environment of plants grown in culture solutions. It was found possible to predict plant yields and to duplicate results.—A progress report on chemical composition in relation to growth and reproductive responses in apple trees was made by Walter Thomas, of Pennsylvania State College, in which certain deficiency indices were described.—F. T. McLean and B. E. Gilbert, of Rhode Island Agricultural Experiment Station, presented results of studies on aluminum toxicity.—G. J. Peirce, of Stanford University, presented further observations on the behavior of algae found in brines, suggesting that these organisms may possibly be regarded as indicators of molecular drift toward regions of crystallization.—Moisture content, foliar transpiring power, and wilting, in relation to curing of hay, were described by A. L. Bakke and E. R. Henson, of Iowa State College, who found that differences between hay cured in the windrow and in the swath were smallest when the evaporation conditions were most intense.—H. L. Van de Sande-Bakhuyzen, of Stanford University, outlined a new theory of growth, permeability and correlation, based principally on hydration phenomena.

ORGANIZATIONS RELATED TO BOTH SECTIONS F AND G

(*Reports from E. W. Sinnott, George D. Fuller, H. J. Van Cleave, L. C. Dunn and Elmer Roberts*)

The American Society of Naturalists (*president*, C. E. McClung; *secretary*, L. J. Cole, University of Wisconsin, Madison, Wisconsin) presented on Friday afternoon a symposium on "Temperature and Life." The speakers emphasized not only the great importance of temperature in all vital activities but also the complexities of its various effects and the many difficulties which confront the physiologist in separating the influence of temperature from those of other factors in the environment. The speakers were as follows: M. H. Jacobs, Royal N. Chapman, James G. Dickson, Chas. F. Hottes and H. L. Shantz. The annual dinner of the society was held jointly with the Botanical Society of America on Friday evening.

The Ecological Society of America (*president*, C. Juday; *secretary*, A. O. Weese, University of Oklahoma, Norman, Okla.) met on Wednesday, Thursday and Friday. There were three general sessions, an invitation program in charge of the president of the

society, and joint sessions with the Botanical Society and with the Society of Zoologists. Business sessions were also held daily and an informal dinner was held on Wednesday evening. The presidential address was given by Dr. Juday, at the morning session on Thursday. It was entitled "Chemical and Biological Studies of Some Lakes in Northwestern Wisconsin." A notable feature of the meeting was an invitation program Wednesday afternoon, consisting of seven papers. Four of these dealt with the inter-reactions of various classes of organisms. S. A. Waksman discussed the question of "Forest Humus, a Problem in Soil Microbiology." Elias Melin reviewed the present state of our knowledge of the "Mycorrhizal Fungi of Forest Soils and Their Relation to Tree Growth." The ecological relations of the root systems of forest trees were also discussed in papers by W. B. McDougall and J. E. Weaver. "The Present Status of Our Knowledge of the Ecology of Protozoa of the Soil" was presented by C. E. Skinner and the "Bio-ecology of Forest and Range" was dealt with in a paper by Walter P. Taylor and W. C. McGinnies. A. G. Vestal discussed the "Forest of the San Francisco Region in Relation to Chaparral and Grassland," and G. A. Pearson's paper was on the "Measurement of Physical Factors as an Aid to Silviculture."—The society confirmed the action of its president and his associates in forming the Ecological Society of America, Incorporated, under the laws of the State of Wisconsin. Simultaneously with incorporation a new class of membership was established, "Sustaining Members," whose dues are \$10.00 per year. The extra funds obtained from such memberships are to be used in the publication of the results of research. The following officers were elected: *President*, H. L. Shantz; *secretary-treasurer*, A. O. Weese, University of Oklahoma, Norman, Okla.

The American Microscopical Society (*president*, Z. P. Metcalf; *secretary*, H. J. Van Cleave, University of Illinois, Urbana, Illinois) held its forty-sixth annual meeting on Wednesday. The following officers were elected: *President*, P. S. Welch; *secretary*, H. J. Van Cleave. The custodian of the Spencer-Tolles Fund, Professor Henry B. Ward, reported that the fund now has properties valued at more than \$12,500. Grants from this fund for the encouragement and support of original investigations are available to members of the society. The report of the treasurer shows a balance of \$1,378.90 in the general fund. The secretary called attention to the fact that sixty new members have been admitted during the year, approximately two hundred having been added during the three years of his term of office.

The Genetics Sections of the American Society of Zoologists and the Botanical Society of America

(chairman, R. A. Emerson; *secretary-treasurer*, L. C. Dunn, Storrs, Conn.) held well attended sessions on Wednesday, Thursday and Friday. The reading of papers occupied three mornings, one afternoon was devoted to demonstrations and on one afternoon the sections met jointly with the Geneticists Interested in Agriculture for a symposium on "Irregularities of Chromosome Behavior in Relation to Plant and Animal Improvement." Forty contributions were offered, twenty-four of them being read at the formal sessions.—Five of the papers read, one of the demonstrations and one of the papers given by title only, dealt with the effect of X-rays on plants and animals. Chief interest centered in the recent attempts to alter the course of inheritance and the frequency of mutation by treatment with X-rays. The most extensive experiments on this question were reported in detail by H. J. Muller, whose paper (for which the American Association Prize was awarded this year) is abstracted in the section on the Prize. By use of a special technique for measuring the frequency of mutations in *Drosophila melanogaster* he obtained results indicating that the application of sublethal doses of X-rays to sperm was followed by a large increase in the mutation rate of treated, as compared with control, cultures. The mutation rate in some treated cultures was estimated at 15,000 times the normal rate. F. B. Hanson, working in Dr. Muller's laboratory at the University of Texas, reported on the direct effect of X-rays on the productivity and sex ratios of *Drosophila* and reported also the appearance of many mutations in the X-rayed cultures. From the botanical side L. J. Stadler reported on the occurrence of new endosperm characters that apparently had arisen by mutation in maize ears X-rayed at the time of fertilization. The same investigator presented evidence for the occurrence of mutations in seedlings from treated barley seeds. T. H. Goodspeed and A. R. Olson reported that many variant types had been found in the progeny of X-rayed *Nicotiana* plants, and gave evidence of a considerable degree of chromosome irregularity following the treatment.—A direct effect of X-rays on colored mice was reported by R. T. Hance.—Four papers dealt with disease resistance. Two showed the inheritance of resistance to specific diseases in chickens.—C. H. Danforth reported that skin grafted from one young chicken to another assumed during growth the characters of the donor in respect to feather color and pattern but assumed the characters of the host in respect to sex and growth rate.—The following officers were elected for 1928: *Chairman*, H. J. Muller; *society representative*, O. E. White.

The Geneticists Interested in Agriculture held their eighth annual meeting jointly with the Genetics Sec-

tions of the Botanical Society and the Society of Zoologists on Thursday afternoon, with about one hundred and twenty-five persons in attendance. The program consisted of a symposium on "Irregularities of Chromosome Behavior in Relation to Plant and Animal Improvement," and a talk by Dr. L. C. Dunn on "Genetics in Europe." A. F. Blakeslee discussed irregularities of chromosome behavior in plants, drawing largely upon his work with *Datura* and pointing out that in many forms various combinations may be produced by breeding and preserved by vegetative reproduction. H. J. Muller emphasized the fact that most of the causes of irregularities in animals were either lethal in effect or produced sterility or other abnormal conditions; consequently little opportunity for animal improvement could be expected from this source. Following the symposium L. C. Dunn spoke briefly of research in genetics in Great Britain, Germany and Russia. Dr. C. M. Woodworth, of the Illinois Experiment Station, Urbana, Ill., was elected chairman.

SECTION H (ANTHROPOLOGY)

Vice-president and chairman, R. J. Terry; *retiring vice-president*, R. Bennett Bean; *secretary*, Fay-Cooper Cole, University of Chicago, Chicago, Ill.

(Report from Fay-Cooper Cole)

Section H held its sessions on Tuesday, Wednesday and Thursday. Since the Anthropological Association was holding its sessions elsewhere the attendance was small, but interest was keen and ample time was allowed for the discussion of papers. The first day was given over to problems relating to individual and race changes, which are of equal interest to physical anthropologists and students of the social sciences. A way must be devised to take the place of laboratory methods used in general biology. Investigations carried on in families which make up the various groups under question was favored.—The second day was devoted to archeology. Among the papers read, that dealing with the excavations of Beloit College in Northern Africa was of special interest. The sites excavated indicate an extensive culture of Aurignacian date, while the skeletal material appears to show a type of mankind varying somewhat from the dominant groups in Europe at that time. A lively discussion followed the presentation of evidence of three finds of relics of man associated with remains of Pleistocene mammalia by Dr. Oliver Hay.—On Thursday the members of the section were conducted, by Professor P. E. Cox, state archeologist of Tennessee, to an extensive series of Indian mounds about thirty miles from Nashville. The anthropology dinner was held Tuesday evening.

SECTION I (PSYCHOLOGY)

* Vice-president and chairman, Knight Dunlap; retiring vice-president, Margaret Floy Washburn; secretary, Frank N. Freeman, University of Chicago, Chicago, Ill.

(Report from Frank N. Freeman)

An important feature of the program of Section I at the Nashville meeting was a joint session with the Southern Society for Philosophy and Psychology. This society holds its regular annual meeting in the spring, but this year it joined officially with Section I for one session. Several papers were contributed by members of the Southern Society and the session at which they were given was perhaps the most interesting of the meeting.—According to custom, Section I joined with Section Q for one session.—In her retiring vice-presidential address Dr. Margaret Floy Washburn presented an able argument in support of the mechanistic conception of animal behavior as contrasted with the vitalistic theory of emergent evolution. Dr. Washburn's address has appeared in SCIENCE for January 13.—The chairman of the section for the next year is Dr. H. C. Warren, and the newly elected section committeeman is Dr. M. Bentley.

SECTION K (SOCIAL AND ECONOMIC SCIENCES)

Vice-president and chairman, W. S. Leathers; retiring vice-president, Joseph H. Willits. The Metric Association (president, George F. Kunz; secretary, Howard Richards, 156 Fifth Ave., New York City) is the only one of the associated organizations that took part in the Nashville meeting.

(Report from Howard Richards)

Section K held no sessions at Nashville. It is hoped that some of the associated societies of this section will hold sessions or contribute programs for the great New York meeting next year. While it seems to be clear that the natural and exact sciences (which virtually make up the field of the American Association at present) and the social and economic sciences have very much in common and that these two groups of investigators have much to gain from some contact with each other, yet it is not generally customary for the two groups to meet at the same time and place. It follows that the sessions of this section in recent years have not generally enjoyed the atmosphere of research and discussion that characterizes the sessions of most of the other sections. The association is hopeful that workers in the social and economic sciences may be willing to join with it, at least at some annual meetings, in order that the research aspect of these great and important lines of

study may from time to time be adequately represented along with the natural and exact sciences. The executive committee of the association will be glad to receive the benefit of suggestions from men of science who are interested in this general project, which is as important as it seems to be difficult.

The Metric Association held its eleventh anniversary meeting on Thursday, with an industrial conference in the morning and an engineers' conference and an educational conference in the afternoon. There were also a Weight and Measure Luncheon and the usual Metric Dinner. Seven metric advocates of Nashville institutions made a strong showing. A steady trend toward complete metric usage was reported.

SECTION L (HISTORICAL AND PHILOLOGICAL SCIENCES)

Section L is not yet organized. In recent years special committees on the history of science and on philology or linguistic science have arranged programs for the annual meetings. For the Nashville meeting no program was arranged on the history of science, which is now being adequately developed by the affiliated History of Science Society, and that society did not meet with the association this year. At the request of the executive committee of the association a session on linguistic science was arranged for this meeting by the newly-formed Linguistic Society of America, which is affiliated. A brief report on this session follows:

(Report from Leonard Bloomfield)

The session on linguistic science was held Friday afternoon with a small but interested group. Discussion was lively. Professor G. M. Bolling, of Ohio State University, presided. There were two papers on general linguistics. Professor E. Sapir (University of Chicago) reported on an association experiment in which a meaning was arbitrarily assigned to a vocal form, this form then altered by small steps, the observer being asked to state the meanings he associated with the altered forms. The results showed a high correlation between specific changes of form and of meaning. Professor Bolling read a paper discussing the postulate that phonetic laws have no exceptions; he pointed out the origin of the postulate's wording in a dispute of fifty years ago, and showed that under a tenable definition of the terms "law" and "exception" or under a modern rewording, the postulate is necessary for the science of language—a necessity which exemplifies the close connection of linguistics with natural science. Two papers dealt with problems of Algonquian study. Professor Truman Michelson (Bureau of American Ethnology) discussed the historical changes owing to which the

Arapaho language to-day diverges from other Algonquian, and pointed out the importance of the alternation of certain sounds in Central Algonquian. Professor Leonard Bloomfield (University of Chicago) presented certain forms of Swampy Cree which confirm a reconstruction that had hitherto depended on purely theoretical prediction. In the field of Indo-European Professor W. Petersen (University of Florida) discussed the Latin *vi*-perfect as an example of the irradiation of a formal element. Linguistic borrowing, as exemplified by loans from American English into the Hungarian spoken in America, was discussed in a paper by Professor F. R. Preveden (DePauw University).

SECTION M (ENGINEERING)

Vice-president and chairman, A. N. Talbot; retiring vice-president, C. R. Richards; secretary, N. H. Heck, U. S. Coast and Geodetic Survey, Washington, D. C.

(Report from N. H. Heck)

Section M met on Wednesday. The program of the morning session was arranged by the Engineering Association of Nashville. An afternoon session and a dinner were held jointly with Section C, the dinner being under the auspices of the Engineering Association of Nashville. The morning program included papers dealing with subjects of general interest but with special local appeal.—Wilbur A. Nelson, Virginia state geologist, discussed methods of developing the natural resources of Tennessee. Methods now in use by successful state geological surveys were described and new methods were suggested.—Major John F. Conklin, U. S. A., discussed the power possibilities of the Cumberland drainage area. The paper showed that the development of power will aid in flood control, while, with proper precautions, it will not interfere with the use of the river for navigation.—C. N. Bass, Tennessee highway commissioner, showed that Tennessee, by an improved highway system, has erased sectional lines and greatly aided progress. Travel in the United States by automobile, expressed in passenger miles, was 2.5 times as great in 1926 as by train. The congestion problem leads to much study.—George C. Fischer, Nashville smoke inspector, discussed smoke abatement in Nashville. Abatement of smoke was undertaken in 1926, by education, inspection, instruction and recommendation. The use of coke helped a great deal and the adoption of underfeed stokers with down-draft boilers has been effective.—C. R. Fountain, of the George Peabody College, on behalf of the institute of Radio Engineers, gave a paper on the contribution of radio to engineering. By ani-

mated motion pictures he showed the behavior of the electrons in radio tubes, etc., and pointed out that radio is a stimulus to youth to study engineering sciences, this being probably its greatest contribution to engineering.—At the afternoon session the address of the retiring vice-president for Section M, Dr. C. R. Richards, on the functions of Section M, was read in his absence. Section M, it is thought, should attempt to bridge the gap between the engineer and the fundamental scientist, furnishing opportunity for the engineer to voice his scientific needs and announce his achievements in adapting science to industry, and for the scientist to forecast the application of new theories and important discoveries. The publication of the results of such discussions should be provided for in some way and this need is an important problem before the section and the association. The main aim should be to establish a bond of interest and sympathy between engineers and scientists. Discussion followed and the project to make effective some of Dr. Richard's recommendations was referred to the section committee of Section M.—N. H. Heck discussed the earthquake situation in the Mississippi Valley, advancing several theories to account for the occurrence of mid-continental earthquakes, the processes of erosion and sedimentation being given important weight. Since no one knows whether or not a future great earthquake is now preparing, the need for scientific investigation is obvious. The plan of Dr. James B. Macelwane, S. J., for seismograph observations, triangulation and precise levels was described. Engineers should not only support this investigation but should keep in touch with work of the same sort being done elsewhere.—John A. L. Waddell presented a remarkable conception of a proposed national institute, to follow the lines of "L'Institut de France," but on a much larger scale. It was suggested that Section M might initiate action in establishing such an institute. After considerable discussion this matter was referred to the section committee, with instructions to make recommendations at the New York meeting.—Professor Thordyke Saville, of the University of North Carolina, was unable to attend the meeting but sent a paper, "Water-power Development and the Interconnected Transmission Systems of the Southeast." By means of the most extensive system of interconnected power stations in the world, power may be relayed from Muscle Shoals and other Alabama water-power stations to the Virginia coal fields and steam-power generated at the mines might be sent in the reverse direction. Great additions will be necessary in the near future, about 60 per cent. of which will come from hydroelectric developments, the rest coming from steam plants. Great need for a comprehensive

investigation of the hydrographic phenomena of all the streams of this system was pointed out.

The address at the dinner was given by H. F. Moore, of the University of Illinois, on the "Mechanics of Materials: a Contribution of Applied Science to Pure Science." The theory of the mechanical failure of solids and the limits of reliability of the theory of elasticity are being worked out in engineering laboratories, and in the future the development of the mechanics of wave stress will probably be demanded. Intellectual aloofness from practical application and self-satisfied contempt of theory are alike marks of a narrow mind. The highway between pure science and applied science is not a one-way street.

SECTION N (MEDICAL SCIENCES)

Vice-president and chairman, G. Canby Robinson; retiring vice-president, Rufus I. Cole; secretary, A. J. Goldforb, College of the City of New York, N. Y.

(Report from A. J. Goldforb)

The Nashville program of Section N included subjects in anthropology, biochemistry, physiology, medicine, public health, parasitology, pathology and pharmacology. There was a program of invited papers and two joint sessions, with Section C (Chemistry) and with the American Public Health Association.—Dr. Rufus I. Cole, director of the Hospital of the Rockefeller Institute, in his retiring vice-presidential address (see SCIENCE for January 20, page 47) emphasized medical science and the sciences related to it. Dr. Aleš Hrdlička, of the U. S. National Museum, discussed the contributions of anthropology to medicine, and *vice versa*. He urged that a chair of anthropology be established in each medical school.—Dr. E. C. Kendall, of the Mayo Foundation, reviewed the problem of biological oxidations, discussing the contributions of chemists and biologists on this fundamental problem of the internal processes of organisms. He pointed out significant results in this field, the calorogenic relationships, the nature of intermediary metabolism, the influence of food accessories on metabolism, the oxidation influence of hormones, with a running commentary on problems still to be solved.—The recent dramatic development of our knowledge of anemia was reviewed by Dr. G. H. Whipple, of Rochester University Medical School, whose pioneer work led to the discovery of the etiology of pernicious anemia. Grains, vegetables and fish are least effective in stimulating hemoglobin regeneration, while leafy vegetables, meats and certain fruits are more effective. Liver is most effective.—Dr. Alfred F. Hess, of New

York University and Bellevue Medical College, outlined the contributions of chemistry, physics and pathology to the solution of the problem of rickets, giving a cogently reasoned analysis of the influence of ultra-violet rays upon bone formation and on chemical substances in the superficial tissues of animals and plants. The effect of such diverse treatments as those of cod-liver oil and light upon normal bone formation were discussed and it was emphasized how specific are the effective wave-lengths and the substances involved and how minute is the quantity that transforms a rachitic animal into a healthy one.

The afternoon session was devoted to important medical problems of particular significance in the South. Colonel A. M. Stimson, of the U. S. Public Health Service, discussed the control of malaria and the extent to which its eradication may be evaluated in terms of money.—Dr. C. C. Bass, of Tulane University Medical School, reviewed the contributions of parasitology to medical science. He outlined cooperative work by workers in these two fields, in the eradication of hookworm, bubonic plague, malaria, etc., and pointed out the necessity of studying the protozoa of the intestine, of the mouth and of the vagina. It was suggested that pellagra may be due not merely to diet deficiencies but to insect hosts as well.—Dr. R. S. Cunningham, of Vanderbilt University Medical School, gave an analysis of tissue reactions to tubercle bacilli.—Dr. E. W. Goodpasture, of Vanderbilt University Medical School, gave the results of a study on a virus disease of poultry, which disclosed bodies that seem to be of great significance in the theory of virus disease in general.

SECTION O (AGRICULTURE)

Vice-president and chairman, L. E. Call; retiring vice-president, C. F. Marbut; secretary, P. E. Brown, Iowa State College, Ames, Iowa. The American Society of Agronomy contributed to the program of one session and the following named societies associated with the section held sessions of their own: the American Society of Horticultural Science (president, E. J. Kraus; secretary, C. P. Close, College Park, Md.), the Potato Association of America (president, H. C. Moore; secretary, Walter M. Peacock, U. S. Department of Agriculture) and the Crop Protection Institute (chairman, W. C. O'Kane; secretary, Paul Moore, National Research Council, Washington, D. C.).

(Reports from P. E. Brown, C. P. Close and Paul Moore)

A joint session with the American Society of Agronomy and the Association of Economic Ento-

mologists dealt with "The Corn-borer Situation." The papers emphasized the need of cooperation in corn-borer research and brought out recent developments in the entomological, agronomic and mechanical aspects of this problem. At the annual dinner of Section O and the associated societies was given the retiring vice-presidential address of Dr. C. F. Marbut, on "A Hitherto Neglected Factor in the Agricultural Situation."

The American Society for Horticultural Science held its annual meeting Tuesday to Thursday, with an attendance that surpassed the record. Some of the points brought out are indicated below. Yields of thirteen or fourteen tons of tomatoes per acre were reported for the varieties Marglobe, Columbia, Norton and Norduke, grown in Indiana.—It was found that the dry-matter content of tomato fruits varied inversely with the soil-moisture content.—Removal of apical buds of young tomato plants delayed production of first fruits about a week. Periodically leaf-pruned tomato plants in soil cultures with a liberal supply of nitrogen showed carbohydrate-nitrogen ratios that varied inversely with severity of pruning which was also true when similar plants were systematically root pruned.—Vitamin A in green asparagus fed to white rats at Michigan State College maintained good health, while rats fed blanched tips lost weight and died.—In Kansas in 1926 and 1927 it was found, with the Worden grape, that there was so little correlation between cane length or cane diameter and crop production that careful selection of canes as to size at time of pruning is not necessary. Peach fruit buds showed negative correlation between length of shoot and carbohydrate content; with high nitrogen content long shoots are produced and carbohydrates are used in growth, but with low nitrogen content little growth occurs and carbohydrates accumulate.—Fall-grown cabbage plants that are to flower in the spring show enlargement of stem apex in fall and winter, the flower-stalk primordium being differentiated about February 1; branches and flowers emerge about April 1.—Sweet-corn varieties with high percentage of translucent endosperm were of higher quality than others; as were also those with low percentage of pericarp and very little starchy endosperm; while high percentage of starchy endosperm is usually associated with low quality.—The haploid chromosome number in pollen mother cells is, in general, 8 for sweet cherries and 16 for sour and Duke varieties; abnormal chromosome behavior is associated with a high degree of pollen sterility in Duke varieties, and to a lesser extent in certain sour varieties. Attention was given to the occurrence of polycary in the microspores of sweet varieties.—Catalase activity of apple blossom buds in autumn varies but little with the

vigor of the trees. No direct relationship was found between catalase activity and bud size.—From studies on ether extracts of year-old tissue of mature Jonathan apple trees it was found that the percentage of fat at the tops of shoots increased in April and decreased in early May.—Apple scions grafted on piece roots change the root character to that typical of the scion variety; variability of trees in the nursery row appears to be due principally to the manner in which the grafts were made and to differences in the scions while the use of seedlings as stocks seems to have little influence.—Hardening or blackening of the calyx end of the pear fruit seems related to the root stock used, being most often found on trees propagated on *Pyrus serotima*, *Pyrus ussuriensis* and Kieffer, but occurring only rarely on *Pyrus communis* or quince stocks.

The Potato Association of America met Wednesday, Thursday and Friday, this being its fourteenth annual meeting, but no report of the session has been received.

The Crop Protection Institute held its annual meeting on Tuesday evening, with a dinner at the Hermitage Hotel. The secretary-treasurer reported excellent progress; there are prospects for some endowment and the institute should be incorporated. Nearly \$75,000 has been available in the last eighteen months and nearly \$50,000 has been expended. Fifteen investigators were employed in projects. The chairman mentioned some of the projects now being worked on and emphasized the great advantage of the present cooperative plans, by which many institutions contribute to the same project. For example, the project on crown gall, under the chairmanship of Dr. R. E. Melhus, enjoys the cooperation of the U. S. Department of Agriculture, the University of Minnesota, Iowa State College and many nurserymen. Among the other projects are those of oil sprays, cattle repellents, oil emulsions, fineness of sprays and organic compounds of mercury and thallium as treatments against insects in stored grain. A promising series of poisons is being developed, derived from furfural, and a study of substances derived from oxidation of oils has been begun. Work is being carried on in fifteen states. Suggestions and constructive criticism is invited.

SECTION Q (EDUCATION)

Vice-president and chairman, Arthur I. Gates; retiring vice-president, Melvin H. Haggerty; secretary, A. S. Barr, University of Wisconsin, Madison, Wis.

(Report from A. S. Barr)

Section Q met on Monday, Tuesday and Wednesday. One session dealt with experimental study of

teaching, one with educational psychology (a joint session with section I), two sessions with matters of school administration and two with miscellaneous researches. The retiring vice-presidential addresses for Sections I and Q were given Tuesday evening at a joint meeting of the two sections with the Phi Delta Kappa Fraternity.

Retiring vice-president M. E. Haggerty spoke on "The Improvement of College Instruction." Pointing out that much present criticism of college instruction was ill-founded, he reviewed some problems peculiar to American colleges and universities: namely, those related to need for new objectives, curriculum construction, personnel management, improvement of examinations and marking systems, better teaching and the training of college teachers. Dr. Margaret Floy Washburn, retiring vice-president for Section I, gave a clear and vigorous paper on "Purposive Action," which has appeared in SCIENCE for January 13. In the discussions on the experimental study of teaching, led by H. L. Donovan (Peabody College), it was pointed out that about eight hundred thousand persons are employed in teaching, a third as many as in all other professions. Considering the rapid turn-over in the teaching profession, its training load is twice that of all other professions combined. Frank N. Freeman (University of Chicago) reviewed the contributions of educational psychology to the development of teaching procedures.

Seven papers on a variety of subjects were read at the joint session of Sections I and Q. Bird T. Baldwin (Iowa Child-Welfare Station) reported on a three-year study of the growth of elementary school children. Some of his results are: A marked overlapping of scores is found in all grades; the median increments on composite scores for boys and girls in the three years show insignificant sex differences; a pupil's future score can be predicted with fair accuracy from his previous score or scores, the difference between the actual score and the estimated score being approximately a half-year's educational growth.—A. S. Courtis (University of Michigan) proposed a new measure of teaching ability, based on the change of rate of growth in the children taught; his paper is to appear in *School and Society*.

Ten papers treated of the various aspects of school administration. G. D. Strayer (Columbia University) reviewed progress made in making school administration more scientific; P. C. Packer (University of Iowa) spoke on the function of the university school of education; N. L. Engelhardt (Columbia University) summarized researches on school buildings; H. F. Clark (Indiana University) read a brilliant paper on public school finance in the light of modern economic theory, pointing out, among many other things,

that although it is usually assumed that schooling increases the income of the individual, yet a study of the earnings of groups of equal ability, the members of which have gone to school different lengths of time, does not support this assumption. Attention to economic theory might show advantages for planning the educational system in terms of the number of people that can be used in each of the occupations and professions.

Twelve papers were read in the two sessions devoted to a discussion of current research. Data gathered by W. C. Ruediger (George Washington University) from about six hundred college students show that 35 per cent. never had a course in physics, while the corresponding percentages for other subjects are as follows: Chemistry, 32; zoology, 59; physiology, 39; history and appreciation of art, 64; ancient history, 11; European history, 23. F. P. O'Brien (University of Kansas) concluded that colleges are successful neither in attracting nor in holding the mentally fit; 53 per cent. of those whose mental scores had placed them in the upper half of the range of high-school graduates do not apply for entrance to any institution of higher learning and the students eliminated (more than half of whom left in the first year) are not inferior. O. W. Caldwell (Columbia University) described the new educational internship of the Lincoln Institute of School Experimentation as a means of training experimental workers. Lentz (Washington University) presented new tests of sex interest. Many other interesting, important and stimulating contributions were made.

ORGANIZATIONS NOT SPECIALLY RELATED TO ANY PARTICULAR SECTION

In addition to those already named, the following organizations held sessions at the Nashville meeting: The Society of the Sigma Xi (president, F. R. Moulton; secretary, Edward Ellery, Union College, Schenectady, N. Y.), the American Nature-Study Society (president, George R. Green; secretary, E. Laurence Palmer, State College, Pennsylvania), the Tennessee Academy of Science (president, W. S. Leathers; secretary-treasurer, John T. McGill, Vanderbilt University, Nashville, Tenn.), the Gamma Alpha Graduate Scientific Fraternity (president, Richard Hartshorne; secretary, Sidney M. Cadwell, 561 W. 58th St., New York City), the Honor Society of Phi Kappa Phi (president, L. H. Pammel; secretary, C. H. Gordon, University of Tennessee, Knoxville, Tenn.), and the Sigma Delta Epsilon Graduate Women's Scientific Fraternity (president, Julia A. Colpitts; secretary, Amy G. McKeel, Cornell University, Ithaca, N. Y.).

(Reports from Edward Ellery, John T. McGill, Sidney M. Cadwell, R. M. Peterson and Amy G. McKeel)

The Society of the Sigma Xi held its twenty-eighth convention on Tuesday. Reports were made by the officers and charters were voted for chapters at the University of Maryland, Lehigh University, University of Illinois College of Medicine, and Kansas State Agricultural College. Officers were elected as follows: *President*, Vernon Kellogg; *secretary*, Edward Ellery; *treasurer*, George B. Pegram. The annual dinner was followed by the Sixth Annual Sigma Xi Lecture, delivered at the Tuesday evening general session of the association, by President Clarence Cook Little, of the University of Michigan, who spoke on "Some Opportunities for Research in Mammalian Genetics."

The American Nature-Study Society met on Tuesday and Wednesday. No report has been received.

The Tennessee Academy of Science, officially affiliated with the American Association, on Monday afternoon joined Section D in a session devoted to reminiscences of the late Edward Emerson Barnard, a native of Nashville. The latter session was opened by Judge Robert Ewing, chairman of the Board of Trustees of Watkins Institute, Nashville, who was a member of the reception committee for the first Nashville meeting, fifty years ago. J. W. Braid, chemist-photographer and instrument maker, spoke of Barnard's first work with Van Stavoren, photographer and portrait painter, his enthusiasm for astronomy, his use of an old spyglass as his first telescope, etc. P. R. Calvert, who was intimately associated with Barnard for eight years in the gallery of R. Poole, successor to Van Stavoren, told the story of Barnard's introduction to Simon Newcomb in the State Capitol at the meeting of the American Association in Nashville in 1877. Barnard joined the association at that meeting. Olin H. Lambeth told of Barnard's exceptional admission to the university as a special student, and at the same time as assistant instructor in astronomy. Robert G. Aitken, Philip Fox and D. W. Morehouse gave interesting accounts of their association with Barnard at the Lick and Yerkes observatories. The session closed with a tribute to Barnard by Miss Mary R. Calvert, his niece and his secretary and assistant for many years at the Yerkes Observatory. Since Barnard's death she has carried to completion his last great work, the "Atlas of Selected Portions of the Milky Way," recently published by the Carnegie Institution of Washington. A collection of photographs, medals and other Barnardiana was on exhibition during the meeting.

The Gamma Alpha Graduate Scientific Fraternity held a dinner Thursday evening, at which Dr. William Crocker, of the Boyce Thompson Institute for Plant Research, spoke on "A Pan-American University in Porto Rico: a Great Move for International Peace." The projected university would be affiliated with the other graduate schools at the University of Porto Rico. Porto Rico is the best common meeting ground for the Spanish and English cultures of the western hemisphere, which among other things makes the island very well suited for an international educational project.

The Honor Society of Phi Kappa Phi held its tenth general convention on Tuesday evening and Wednesday. There was an active discussion of concrete methods for the encouragement of scholarship in educational institutions. Favorable action was taken on a petition for a chapter at Parsons College, Fairfield, Iowa. Officers were elected as follows: *President*, R. C. Gibbs; *secretary*, C. H. Gordon.

The Sigma Delta Epsilon Graduate Women's Scientific Fraternity held its annual convention following a breakfast on Wednesday morning. The breakfast was open to all women interested in science and was attended by fifty-seven women, representing twenty-eight institutions. Dr. Frances Wick, of Vassar College, spoke on "Some Reflections upon Invisible Radiations and Their Effects," and her talk was much appreciated by physicists and biologists alike.

SPECIAL NOTES

(1) This issue of SCIENCE contains the reports of the sessions of sections and societies at Nashville. The general reports of the meeting have appeared in the preceding issue, for January 27.

(2) Copies of the issue for January 27 may be had free from the permanent secretary's office, Smithsonian Institution Building, Washington, D. C., so long as the supply lasts.

(3) Members who were enrolled for the year 1927 but who have not yet sent in their dues for 1928 are asked to do so now; otherwise the journal subscriptions can not be continued longer.

(4) All who are interested in the advancement of science and education should belong to the American Association. New members are received at any time. Information about the organization and work of the association and about the responsibilities and privileges of membership therein may be secured at any time from the permanent secretary's Washington office, Smithsonian Institution Building, Washington, D. C.

SCIENTIFIC EVENTS

NATIONAL RESEARCH FELLOWS AT
PRINCETON UNIVERSITY

DEAN ANDREW FLEMING WEST, of the Princeton Graduate Schools, writes in his report to President John Grier Hibben:

Since the World War provision has been made for appointing specially qualified persons as National Research Fellows in mathematics, physics and chemistry. Up to the present time there have been 188 graduates of American universities appointed to these fellowships. The following table shows all the universities which have trained ten or more of these fellows and have received ten or more of them for advanced study after their appointment.

PLACE OF GRADUATE TRAINING

1. Princeton University	22
2. University of Chicago	21
3. University of California	13
4. Yale University	13
5. Harvard University	12
6. University of Wisconsin	12
7. The Johns Hopkins University	11

REGISTERED AS NATIONAL RESEARCH
FELLOWS AT

1. Harvard University	41
2. Princeton University	32
3. California Institute of Technology	30
4. University of Chicago	28
5. University of California	13
6. Yale University	11

It thus appears that Princeton heads the list in the number of National Research Fellows trained and comes second in the number of National Research Fellows registered for advanced study. We could hardly ask for a more striking proof of the wisdom of the policy of limited enrolment and strict standards of admission to our Graduate School.

PRESENTATION OF THE NICHOLS MEDAL
TO PROFESSOR HUGH S. TAYLOR

AWARD of the Nichols medal for 1928 to Professor Hugh S. Taylor, head of the department of chemistry in Princeton University, already noted in SCIENCE, was announced on January 18 by the New York section of the American Chemical Society.

The award, determined by "the research published during the current year which in the opinion of the jury is most original and stimulative to further research," will be formally conferred upon Professor Taylor at a national gathering of chemists in Rumford Hall, New York City, on March 9, when he will deliver an address on "Catalysis as an Inspiration of Fundamental Research."

Other speakers will include Professor James Kendall, head of the department of chemistry in New

York University, and Professor Wilder D. Bancroft, of Cornell University. The medal was established in 1903 by Dr. William B. Nichols, a charter member of the American Chemical Society, to encourage original research in chemistry.

The jury of award consisted of Professor Arthur W. Thomas, Columbia University, chairman; D. H. Killeffer, secretary of the New York Section; Dr. B. T. Brooks, consulting chemist; Dr. C. E. Davis, chief chemist of the National Biscuit Company, and Dean Kendall.

Dr. Taylor was appointed professor of physical chemistry at Princeton in 1922, and occupied this position until last year, when he was appointed to the newly created research professorship of chemistry. This chair was contributed by Miss Gwethalyn Jones, of Chicago, in memory of her father, David B. Jones, a graduate of Princeton, and as part of the newly organized endowment for scientific research in Princeton University.

MEDAL PRESENTATIONS TO GENERAL
CARTY AND DR. COOLIDGE

THE John Fritz medal, which was awarded to General John J. Carty in November, 1927, and the Edison medal, which was awarded to Dr. William D. Coolidge in December, 1927, will both be presented to the medalists at a meeting to be held in the Engineering Auditorium, New York City, on February 15, in connection with the annual winter convention of the American Institute of Electrical Engineers. Members of the engineering profession and other friends of the medalists are invited to attend.

The presentation ceremonies will include an address by Dr. Michael I. Pupin, who will outline the achievements of Dr. Coolidge, the presentation of the Edison medal by President Gherardi, of the American Institute of Electrical Engineers, and the response of the medalist; the announcement of the John Fritz medal award by Chairman J. V. W. Reynders, of the board of award, an outline of the achievements of General Carty by Bancroft Gherardi, the presentation of the John Fritz medal by Robert Ridgway, chairman of the board when the award was made, and the response of General Carty.

The John Fritz medal was awarded to General Carty "for pioneer achievement in telephone engineering and in the development of scientific research in the telephone art. The award was made unanimously by a board composed of sixteen representatives of the American national societies of civil, mining, mechanical and electrical engineers, having an aggregate membership of 57,000.

This medal is awarded not oftener than once a year for notable scientific or industrial achievement.

It is a memorial to John Fritz, late of Bethlehem, Pennsylvania, long a leader in the iron and steel industry of America.

The Edison medal was awarded to Dr. William D. Coolidge "for his contributions to the incandescent electric lighting and the X-ray arts." This award was made unanimously by the Edison medal committee, consisting of twenty-four members of the American Institute of Electrical Engineers.

SCIENTIFIC NOTES AND NEWS

DR. THEODORE W. RICHARDS, director of the Gibbs memorial laboratory at Harvard University, has been elected a corresponding member of the French Academy of Sciences, in the section of chemistry.

DR. SIMON FLEXNER, director of the Rockefeller Institute for Medical Research, has been elected an honorary member of the Vienna Microbiological Society.

THE Royal Photographic Society, London, has awarded the Progress Medal, the highest honor the society can bestow, to Dr. S. E. Sheppard, of the Kodak Research Laboratories.

PROFESSOR E. W. BROWN, professor of mathematics in Yale University, has been elected an associate of the Royal Academy of Belgium. M. Armand Renier, director of the geological services of Belgium, and Professor Lucien Hauman, professor of botany in the University of Brussels, have been elected *correspondents* of the academy.

THE gold medal of the Royal Astronomical Society has been awarded to Professor R. A. Sample, astronomer-royal for Scotland, for his theory of the four great satellites of Jupiter. Jackson-Gwilt bronze medals have been awarded to Dr. W. H. Stevenson for his work on faint variable stars and Herschel instruments, and to W. Reid, of Cape Town, for his discovery of six new comets.

PROFESSOR SERGIUS VON OLDENBURG, president of the Russian Academy at Leningrad, has been made a corresponding member of the Prussian Academy of Sciences.

PROFESSOR EMIL ABBERHALDEN, of the University of Halle, Professor Ludolf von Krehl, of the University of Heidelberg, and Professor Georg Rost, of the University of Freiburg, have been made honorary members of the Academy of Medicine of Rome.

DR. J. WALTER FEWKES retired as chief of the U. S. Bureau of American Ethnology on January 15. Dr. Fewkes was appointed ethnologist in the bureau in 1895 and chief of the bureau on March 1, 1918. His retirement will allow him to complete manuscripts

on certain field researches already accomplished, and he will at the same time continue to cooperate in the work of the bureau.

CHARLES C. WILLOUGHBY, who retires as director of the Peabody Museum of American Archeology and Ethnology at Harvard University next September, has been made director emeritus.

AT a recent meeting of the trustees of the Academy of Natural Sciences of Philadelphia, Mr. William Procter, of Bar Harbor, Maine, was elected research associate in marine biology. Mr. Procter has organized and is conducting a biological survey of the Mount Desert Region, Maine. A well-equipped marine laboratory located at Corfield, Bar Harbor, Maine, has just been completed where he, with a scientific staff of five men, will continue during the summer months the work begun two years ago in temporary quarters.

J. ERIC THOMPSON, of the Field Museum of Natural History, has left for British Honduras, as the head of an expedition which will investigate the civilization of the ancient Maya Indians.

PROFESSOR W. L. BRAGG, Langworthy professor of physics at the University of Manchester, England, will give a series of lectures on "Crystal Physics" at the Massachusetts Institute of Technology. The course of thirty lectures will start on February 7 and will be given Tuesday, Wednesday, Thursday and Friday afternoons at 4 o'clock.

DR. LEON W. COLLET, professor of geology and paleontology, University of Geneva, Switzerland, gave a lecture on "The Formation of the Alps" at the American Museum of Natural History on January 27.

SIR ARTHUR NEWSHOLME, formerly principal medical officer, local government board for England and Wales, will lecture on the evenings of January 25 and 26 at the University of California on "Dying Diseases" and "The Good Samaritan up to date." Sir Arthur was formerly a visiting professor at the Johns Hopkins University School of Hygiene and Public Health, Baltimore.

UNDER the auspices of the recently established Mead-Swing foundation, Professor Herbert S. Jennings, of the Johns Hopkins University, recently gave two lectures at Oberlin College, as follows: January 12, "Biological Fallacies and Human Affairs," and January 13, "What can We Hope from Eugenics?"

THE New York Academy of Medicine conducted a symposium on graduate medical education on January 19; the speakers were Drs. Louis B. Wilson, Mayo Foundation; Ludwig Kast, New York, and John E. Jennings, Brooklyn.

DR. GEORGE F. KAY, state geologist of Iowa, gave

an illustrated lecture to the staff and graduate students of the department of geology of the University of Chicago, on January 16. The subject was "The Present Status of the Glacial Studies in Iowa."

DR. W. J. HUMPHREYS, of the U. S. Weather Bureau, gave an illustrated lecture on "Clouds and Cloud Splendors" to the Sigma Xi of the University of Kentucky, on January 19.

DR. WALLACE OSGOOD FENN, professor of physiology at the University of Rochester, will deliver the fourth Harvey Society lecture at the New York Academy of Medicine, on February 10. His subject will be "The Metabolism of Nerves."

THE memory of Dr. Albert J. Ochsner is honored by the American College of Surgeons which has established on Ochsner memorial foundation for clinical research. Three months after Dr. Ochsner's death in July, 1925, the board of regents of the college of surgeons established the memorial fund with a grant of \$100,000 and the appointment of a committee to secure an additional \$900,000. It was announced at the recent meeting of the college in Madison that the fund now has reached \$300,000.

THE University of California at Los Angeles will move, as has already been announced, to a new site on the hills overlooking the Pacific, west of Los Angeles. The main classroom building is to be called Josiah Royce Hall, and is to contain a complete collection of Royce's writings as a memorial to him. A correspondent writes: "In view of the fact that Royce was so frequent a contributor to the pages of SCIENCE, I have thought that the journal might like to call attention to this commemoration. The Royce collection, when completed, will offer to the student a fuller and more intimate access to the thought of Royce than exists elsewhere. The department of philosophy is responsible for the completing of the collection. Any information regarding the existence of works, addresses or articles by Royce now out of print would be of great assistance."

WILLIAM C. MILLS, curator of the department of archeology of Ohio State University, died on January 17, aged sixty-eight years.

DR. ANNA MORSE STARR, associate professor of botany at Mount Holyoke College, recently died at the age of sixty years.

FREDERICK LEROY SARGENT, of Cambridge, Mass., at one time professor of botany at the University of Wisconsin, and associated with the Harvard Botanical Museum, died on January 16, at the age of sixty-four years.

PROFESSOR GEORG FENDLER, until recently chem-

ical director of the new research institute for food-stuffs in Berlin, recently died, aged fifty-four years.

THE annual meeting of the British Association for the Advancement of Science will be held in South Africa in 1929.

THE second meeting of executives of the chemical industries will be held in Washington, D. C., on February 16, under the auspices of the U. S. Department of Commerce.

THE city of Moscow has appropriated \$150,000 for a planetarium to demonstrate to the people how the solar system functions. The planetarium, identical with the one in Berlin, has been ordered from the Zeiss Optical Company, Jena.

A FELLOWSHIP for investigating the effects of ethylene in low concentrations in the air and in foods upon animal metabolism, and the acceleration of enzyme action by ethylene has been instituted at the University of Minnesota by the Eli Lilly Co., manufacturing chemists. The holder of the fellowship, Elmer T. Ceder, is working under cooperation between the department of pharmacology under Dr. A. D. Hirschfelder and the section of plant physiology of the Minnesota Agricultural Experiment Station with Dr. R. B. Harvey.

THE committee in charge of the Institute of Chemistry of the American Chemical Society is anxious to get the best films on chemical and related subjects for presentation at the Institute of Chemistry which meets in Evanston, Illinois, from July 23 to August 18, 1928. Those who have seen unusually good films are asked to write the chairman of the committee, Frank C. Whitmore, National Research Council, Washington, D. C., or the executive secretary, Charles D. Hurd, Northwestern University, Evanston, Illinois.

THE Boyce Thompson Institute for Plant Research, Inc., has completed arrangements to provide for the future welfare of its employees. A program of co-operative retirement and death benefit has become effective through contract with the Metropolitan Life Insurance Company. Upon presenting this to the employees, 98 per cent. of those who were eligible applied for membership. Under the retirement provisions, an employee who retires at the age of 65 will receive a life income. The amount of this income will depend on the salary and the number of years of service at the institute. It is found that this averages 2 per cent. of the salary for every year of service. The death benefit provision ranges from \$1,000 to \$3,000. In case an employee is disabled before rendering 5 years of service, the death benefit is payable in installments. In case the disability occurs after 5

or more years of service a disability pension is payable for life. Another helpful provision is that the subscribing employees are also entitled to the service of a visiting nurse furnished free of cost by the insurance company.

THE survey made by the Social Science Research Council of the rural sociology research in progress in the United States in the year 1926-27 showed that \$400,000 was being expended on 86 projects. Of this total, \$175,000 was being expended by land-grant colleges and agricultural experiment stations in 21 of the states. The \$400,000 total was almost exclusive of all sums spent by federal bureaus.

THE records of the Great Lakes Ornithological Club have recently been given to the Royal Ontario Museum of Zoology, Toronto. These records cover the period from May, 1905, to December, 1927, and include observations on the occurrence and abundance of birds both migrant and resident at Point Pelee, Ontario. This area is of special interest for two reasons. Extending into Lake Erie as it does it serves as a sort of funnel through which migrations are concentrated, and, being the most southern mainland point in Canada, some birds typical of more southern regions are found as residents of Canada only at this point.

ACCORDING to the Experiment Station *Record*, provision was made by the last Alabama legislature for five substations to be known as the Tennessee Valley, the Sand Mountain, the Black Belt, the Wire Grass and the Gulf Coast Substations. Two of these substations are to be established prior to September 30, 1928, and the remainder during the following year. An appropriation of \$25,000 was made for buildings and equipment for each substation and \$12,000 each for maintenance and operation. The act requires the donation of not less than 200 acres of representative soil for each substation.

ON November 8 the steamer *Halcyon*, of the U. S. Bureau of Fisheries, was sold at Woods Hole, Mass. The *Halcyon* is a wooden vessel 108 feet 6 inches long, over all, with a 22-foot beam and 10-foot draft, built in 1917. Her cost, including equipment, was \$44,000. The vessel was well built but of unusual design, being planned originally for both the collection of seed lobsters along the Maine coast and offshore investigations. After the acquisition by the bureau of the *Albatross II*, the need for the *Halcyon* ceased.

SPONSORED by King Albert and the leading industrialists and financiers of Belgium, a move has been started for the establishment of a permanent museum and laboratory for scientific research. It will probably be situated in Brussels. It is hoped to develop the projected museum and laboratory into a center of study where all nations would exhibit their scientific

equipment. The first of the exhibitions would be held in 1930.

UNIVERSITY AND EDUCATIONAL NOTES

A. P. GIANNINI has placed his 1927 income, as president of the Bancitaly Corporation, at the disposal of the University of California. Under the terms of the gift, \$1,000,000 will go toward the establishment of the Giannini Foundation of Agricultural Economics and \$500,000 will be used for erection of a building on the university campus in Berkeley, dedicated to ways and means of improving the economic condition of farmers, dairy and livestock men and fruit growers in California.

DR. JOHN GOODRICH CLARK, who was chief gynecologist at the University of Pennsylvania when he died last May, left an estate of over \$1,000,000, a large part of which will go to the university.

LARS G. ROMELL, of the Swedish Forest Experiment Station at Stockholm, has been appointed to the Charles Lathrop Pack research professorship in forest soils at Cornell University and will take up his duties about April 1. The establishment of this professorship, said to be the first of its kind in an American university, has been made possible by the recently announced endowment of \$130,000 for the chair, together with important additional gifts for its operating funds, from the Charles Lathrop Pack forestry trust.

PROFESSOR LEON BRILLOUIN, of the Collège de France, has been appointed acting professor of theoretical physics in the University of Wisconsin for the second semester of the academic year 1927-28.

DR. JESSE PERRY ROWE, professor of geology at the University of Montana, has been appointed visiting professor of geology at Princeton University for the academic year 1928-29.

DR. HERBERT SPENCER HARNED, professor of physical chemistry at the University of Pennsylvania, has been appointed professor of the same subject at Yale University.

DISCUSSION AND CORRESPONDENCE

DISCOVERY OF FURTHER HOMINID REMAINS OF LOWER QUATERNARY AGE FROM THE CHOU KOU TIEN DEPOSIT

AT a meeting of the Geological Society of China held on December 2, 1927, announcement was made of the discovery of a lower molar hominid tooth in the cave deposit at Chou Kou Tien near Peking. The new specimen was obtained close to the site from which the first hominid teeth from this locality were

recovered and in the same stratum of the deposit. (V. this Journal, Dec. 17, 1926, p. 586.) This deposit, which at first was thought to be Upper Pliocene, is now known to be basal Lower Quaternary in age (very early Pleistocene). The find was made on October 16 by Dr. Birger Bohlin, paleontologist attached to the Geological Survey of China. Mr. C. Li, geologist from the survey, and Dr. Bohlin have been in charge of the extensive excavations on this important site which have been carried on during the past season by the Geological Survey in cooperation with the department of anatomy of the Peking Union Medical College.

The tooth is a relatively unworn and perfectly preserved left lower permanent molar, having incompletely formed root tips and evidently from an individual in the stage of development represented by that of an eight-year-old modern European child. The general morphology of this specimen leaves no room for doubt as to its hominid status and it evidently was derived from the same jaw as that from which came the lower premolar tooth discovered last year by Dr. O. Zdansky. A full description of the latter specimen and of the associated worn upper molar has been published this year by Dr. Zdansky. (v. *Bull. Geol. Soc. China*, Vol. V, No. 3.)

Evidence of a convincing nature points to a close mutual relationship between the two individuals, adult and immature, represented by the teeth recovered from the Chou Kou Tien deposit. The newly discovered specimen displays in the details of its morphology a number of interesting and unique characters, sufficient it is believed to justify the proposal of a new hominid genus *Sinanthropus*, to be represented by this material. A complete and fully illustrated report on this new specimen is now in press and will be published early in December in Series D, *Palaeontologia Sinica*, Vol. VII, Fasc. 1.

DAVIDSON BLACK

DEPARTMENT OF ANATOMY,
PEKING UNION MEDICAL COLLEGE,
PEKING, CHINA
NOVEMBER 24, 1927

AN INSTANCE OF THE INCREASE OF MALARIA BY CIVILIZATION

IN 1910, in the *Atti Soc. per gli Studii della Malaria* (Rome), the writer published an article about the apparently paradoxical situation that results in the gradual disappearance of malaria following the settlement of a new country and its reappearance as the result of a dense civilization. The perfectly obvious reasons for this were detailed in the article.

Just now a new and striking instance comes to my eye in an important paper, just received, entitled "Report of an Investigation of a Malaria Epidemic in Solo (Dutch East Indies), 1926," by S. L. Brug and Dr. E. W. Walsh (Batavia, 1927).

It seems that in the old days a part of the city of Solo (150,000 inhabitants) was from time to time inundated during the wet monsoon. The Dutch authorities diked one side of the city and constructed a storm-water canal on the other. This storm-water canal is flushed at regular intervals during the wet monsoon, and during the dry monsoon carries comparatively little water. Pools form in the corrugated bottom and others are made by the digging of sand for cement used in making houses. Formerly the town seems to have been comparatively free from malaria, but towards the end of 1925 this disease began rapidly to increase, with a high mortality, reaching a climax in January, 1926.

Although, of course, there were other breeding places of *Anopheles*, the portions of the city most affected were along the storm-water canal which had not been flushed for an abnormally long time. It is reasonably supposed that the *Anopheles* carriers bred in the storm canal pools, and that the normalization of the water of the canal at all times in the future is plainly indicated.

L. C. HOWARD

WASHINGTON,
JANUARY 7

THE SCIENTIFIC MEN OF HARVARD AND OF COLUMBIA

IN my statistical study of the distribution of American men of science, printed in the fourth edition of the "Biographical Directory of American Men of Science" (December, 1927) and in abstract in *SCIENCE* (November 25, 1927), it is stated that of 1,176 leading scientific men of the United States, Harvard has 89.5 and Columbia 46.5 (the fraction referring to a part time or emeritus position), whereas in 1906 of the leading 1,000 scientific men Harvard had 66.5 and Columbia 60. It is also shown that when the men are weighted by objective methods (the situation being substantially the same when they are only counted) Harvard stands first among universities in seven of the twelve sciences, second in three and third in one, whereas Columbia stands first in only one science and in no other has a rank among all institutions higher than fifth.

While not mentioned in the book, it may be noted that the disparity between the two universities is greatly increased by the circumstance that Harvard has 1,088 officers of instruction, Columbia, 2,075.

Harvard has one scientific man of high standing for 121 students, Columbia one such man for 693 students, part time students being in both cases included. Harvard has one member of the National Academy of Sciences for 31 teachers, Columbia one member for 172.5 teachers. Exactly one third of the Columbia members (who are more than one fourth of all members of the academy in these subjects) are in departments of which I was once head and were brought to the university by me long before they had been elected to membership in the academy.

A letter has been received from a distinguished officer of Columbia University in reference to these statistics, stating that it is proposed to see "what information you had to go on for the statement that is so entertaining. . . . It will be great sport." It has even been intimated that my figures are influenced by personal prejudice, which brings to mind a more or less relevant academic anecdote. After a professor of dermatology had been called to a German university, it was rumored among the students that it was because the professor of pathology had been cured by him of a serious disease. At the first opportunity the professor of pathology addressed his class, indignantly explaining that no German professor would in such a matter be influenced by personal considerations, and adding, "It is true that Dr. X treated me for —, but he could not cure me."

As a matter of fact the selection of the scientific men for my statistical work is entirely impersonal. This is obvious from the published descriptions of the methods used, but it should be emphasized, for I have had not only many letters (one from a Harvard professor on the day that this is written, accusing me of awarding a star to a man because he had been appointed to a professorship at Columbia!), but also visits asking that stars be assigned, and they have even been added to the sketches when the printed proofs were returned. The final vote was from 1,196 of the 1,572 leading scientific men of the country and my only part was to be one of 66 who voted for the psychologists.

As the relative position assigned by the statistics to Harvard and Columbia in zoology has been especially questioned, it may be desirable to consider it from another aspect. The names of individuals in my statistical work have not been used by me, though this has been done by others, for they are available to any one who checks over the some 13,500 names in the book. We have, however, in the membership of the National Academy of Sciences a criterion which while less exact still has high validity for purposes of comparison.

Zoology is in fact next to psychology the strongest scientific department at Columbia and its strength is

MEMBERS OF THE NATIONAL ACADEMY
OF SCIENCES

HARVARD

COLUMBIA

Zoological Sciences

W. B. Cannon	G. N. Calkins
W. E. Castle	T. H. Morgan
W. T. Councillman	Edmund B. Wilson
Harvey Cushing	
William Duane	
Otto Folin	
L. J. Henderson	
Reid Hunt	
E. L. Mark	
G. H. Parker	
Richard P. Strong	
W. M. Wheeler	
Edwin B. Wilson	
Hans Zinsser	

Botany

E. M. East	R. A. Harper
B. L. Robinson	
Roland Thaxter	

Geology

R. A. Daly	C. P. Berkey
W. M. Davis	

Mathematical and Physical Sciences

S. I. Bailey	M. T. Bogert
Gregory P. Baxter	Edward Kasner
George D. Birkhoff	M. I. Pupin
P. W. Bridgman	
Edwin H. Hall	
C. L. Jackson	
A. E. Kennelly	
E. P. Kohler	
A. B. Lamb	
Theodore Lyman	
Arthur Michael	
William F. Osgood	
G. W. Pierce	
Th. W. Richards	
Frederick A. Saunders	
Albert Sauveur	
Harlow Shapley	
George F. Swain	

Psychology and Anthropology

Franz Boas
John Dewey
Edward L. Thorndike
R. S. Woodworth

emphasized by the possession of the two most distinguished zoologists of the United States. It is indeed overemphasized by this circumstance as one of them (now over seventy-one years of age) will soon retire and the other will soon pass to the new heaven for good Americans in southern California.

In my classification the zoologists of the American Museum were assigned to it and the zoologists of the

Carnegie Institution to it, and this should be taken into consideration. But it may also be noted that Harvard University and the Massachusetts Institute of Technology have close relations and if the projected union had been formed, the strength of the institution would have been 109.5, in place of the 89.5 assigned to Harvard.

The members of the National Academy of Sciences in the zoological sciences who are at Harvard and Columbia are printed here, biophysics, biochemistry and vital statistics being included. In order to show the exact situation the lists of members of the academy are given also for the other sciences.

This information is printed not in order to exalt Harvard, but rather in the interest of Columbia. The economic evolution of the modern world should now establish the greatest of universities in New York City. If Columbia can not become worthy of this position, it must be the work of the state and the city.

During the ten years of Seth Low's administration many distinguished professors were called to Columbia and it attained a rank nearly equal to Harvard, the number of leading scientific men in the two universities then being 60 and 66.5. During the last twenty-five years Columbia has been losing ground, not only in the sciences but also in other fields. President Butler himself remarks in his annual report for 1925 that Columbia University can not replace "older scholars of distinction and large achievement" because "a choice must be made from a larger or smaller group of mediocrities." This situation is in part due to the attitude expressed by a prominent trustee who wrote¹ in 1921: "It is very difficult to discharge professors once employed. They make common cause and howl about academic freedom. We have had trouble along this line in Columbia, where they taught sedition and disloyalty, and that enabled us to get rid of eight or ten at the time."

Trustees and administrative officers must learn that the greatness of a university is not in building, nor in endowment, nor in number of students, but in men and in the freedom and the opportunity given to them.

J. McKEEN CATTELL

REPORTS

ADDRESS OF THE PRESIDENT OF THE AUSTRALASIAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

IN his presidential address to the Australasian Association for the Advancement of Science at Hobart,

¹ "A Barton Hepburn: His Life and Service to his Time." By Joseph Bucklin Bishop. New York, 1923. Page 293.

on January 16, 1928, Mr. R. H. Cambage referred to the great need for the further application of science to primary production. This, he said, embraced such fundamental utilities as the production of grain, fruit, butter, wool and meat, and he stated that it was a matter for satisfaction that the Commonwealth and State Governments, as well as private bodies, were showing increased appreciation of the value of science to these problems.

He mentioned that a few years ago a thorough knowledge of dairy bacteriology and its application to the production of butter had resulted in increasing the output of first grade butter in New South Wales from 48 to 96 per cent.

When referring to wheat he said: "It is difficult to find anything among the primary products of Australia which owes more to science than wheat production. This is a matter of national concern, and it is most comforting to know that the great pioneering work carried out by William James Farrer is not only being continued at departmental experiment farms and universities, but with most progressive results. New and better drought and rust-resisting varieties of wheat and other grain are being produced, and experiments are being made for the purpose of breeding rust and flag-smut-resisting plants which will also have other good characters."

Mr. Cambage referred to the action of the pastoralists in arranging for the Australian Pastoral Research Trust to receive a contribution at the rate of two shillings a bale of the 1927 wool-clip, with the hope of raising £200,000, for scientific research in connection with the industry. This action he regards as a most definite advance in Australia in the recognition of the benefits of science.

He commended the recent action of the Federal Government in inviting five leading pastoralists to act as a committee to enquire into the conditions of the pastoral industry in Australia, and advise on the best methods of conserving the national wealth represented by the industry. It provides, he stated, further evidence that the authorities concerned are quite alive to the necessity of abandoning the old happy-go-lucky methods of trusting to chance in regard to seasons, but rather look for the introduction of some reasonable scheme of insurance that may have for its object the avoidance of excessive losses rather than the making of enormous profits.

He concluded the first portion of his address by saying that it is the desire of the Australasian Association for the Advancement of Science, which includes New Zealand, to inspire and stimulate a science sense in the public mind, and this, he thought, could best be done by demonstrating how the principles of

pure science may be applied successfully to familiar economic problems.

In the second part of his address Mr. Cambage discussed the "Origin and Development of Portion of the Australian Flora." He summarized the position as follows:

There appear to be more genera common to Africa and the eastern half of Australia only than to Africa and the western half of Australia only, so that evidence of a direct land connection between these two countries is meager. It is thought that many genera which are common to Africa and Australia have reached these countries from the same source in the north, and have then developed in response to environment.

From available evidence it would seem that, at least since Cretaceous time, the northern hemisphere has had a greater land mass than the southern, and, as a result, there has been more room for plant development in the north than in the south. Probably the Pleistocene and even earlier glacial periods have been instrumental in permitting many genera to pulsate across the tropics from temperate northern regions, and in the process, and after arrival in the south, there have been much radiation, development and evolution. Although there probably has been more migration to Australia from the north, there is evidence in some cases of secondary radiation from the south, especially in the genus *Eucalyptus*.

It seems undoubted that some genera common to Australia and New Zealand have reached both countries from the north, some species coming down the east coast of Australia, while others have gone by way of New Caledonia and adjoining islands to New Zealand. Except for a land connection between northeastern Australia and islands to the north, perhaps as late as Pliocene time, Australia has long been isolated from the rest of the world. There appears to be more evidence in favor of a former land connection between Antarctica and South America, and perhaps New Zealand and Australia, than between Africa and Antarctica.

Studies of the many changes which have taken place in the history of the world's flora, of its adaptability to environment, its response to changes of climate and soil, its ability to overcome many adverse conditions, all combine to impress one with the conviction that the marvelous act of creation not only embodies the initial giving of life, but also provided inherent power and initiative for the necessary development and evolution required for the persistence of that life, in harmony with its varying surroundings and dominating influences.

SPECIAL ARTICLES

NUTRITIONAL ANEMIA ON WHOLE MILK DIETS AND ITS CORRECTION WITH THE ASH OF BEEF LIVER

In an earlier article¹ we published data showing

¹ E. B. Hart, C. A. Elvehjem, J. Waddell, R. C. Herrin, *J. Biol. Chem.* 1927, LXXII 299. Iron in Nutrition. IV.

that experimental anemia in rabbits induced by the feeding of a whole milk- Fe_2O_3 diet could be corrected by the addition of the ash of lettuce or of cabbage. In the case of animal tissues, both dried liver and dried "spleen-marrow" were found to be potent if fed at a level of 2 gms. per animal per day as a supplement to the whole milk- Fe_2O_3 . The daily administration of the ash of 2 gms. of dried "spleen-marrow" delayed the onset of anemia to some extent, but appeared inefficient over a long period of time.

This paper deals with experiments on the use of the ash of beef liver as a corrective or preventative of nutritional anemia. Rats were used as the experimental animal. They were selected at 50-60 gms. in weight and placed on screens with whole milk as the sole diet. They were weighed weekly and hemoglobin determinations made periodically by the Newcomer method. When the hemoglobin readings had reached 6-8 gms. per 100 cc. of blood, and the evidence was sufficient that the animal had become anemic but not beyond the possibility of response, the use of the experimental ration was begun. The animals were then fed on screens in separate cages and individually. The normal hemoglobin content of rat's blood may be taken at 12-14 gms. per 100 cc. of blood. After the animal was placed on the experimental diet weekly weighings and periodic determinations of the hemoglobin were continued.

In experimental anemia induced by whole milk feeding there is iron starvation as one of the factors in operation. To determine how effective additions of iron salts may be in the correction of this anemia $FeCl_3$ was prepared from standard iron wire of highest purity. Two gms. of iron wire were dissolved in dilute HNO_3 , the solution of ferric nitrate evaporated to dryness, taken up in excess of HCl , the iron precipitated with NH_4OH , filtered and washed thoroughly until free from chlorides. The precipitate was then dissolved in the theoretical amount of HCl necessary to convert the Fe to $FeCl_3$. In order to obtain complete solution of the $FeCl_3$ an excess of .42 gms. of HCl was added and the solution made to a volume, 1 cc. of which equaled 1.0 mg. of Fe. The $FeCl_3$ was fed at a level of 0.5 mgs. of Fe per animal per day without a resultant correction of the anemia.

We next turn to beef liver and beef liver ash. This material was dried at 65° C. over a period of 6-7 days and then ground to a fine powder. In certain experiments the dried liver was fed directly by suspending it in the whole milk. Iron determination on the dried liver showed that it was necessary to feed daily

Nutritional Anemia on Whole Milk Diets and its correction with the Ash of Certain Plant and Animal Tissues or with Soluble Iron Salts.

1.72 gms. of this material in order to introduce 0.5 mgs. of iron—a quantity exactly equivalent to the iron fed as FeCl_3 . In addition the ash of the dried beef liver was prepared by incinerating the material in porcelain dishes in an electric furnace at 650° – 750° C. After incineration to an ash the ash was digested in strong HCl for six hours at room temperature, diluted with water and the insoluble residue filtered off. The filtrate was evaporated almost to dryness, taken up with water, and diluted to a volume, 1 cc. of which was equivalent to 1.0 mg. of Fe. This solution was not perfectly clear.

This HCl extract of liver ash was fed to anemic rats at a level which introduced 0.5 mgs. of Fe daily. It was administered by directly stirring it into a portion of the daily allowance of whole milk. The results from the use of these materials in contrast with the FeCl_3 from iron wire were indeed very striking and showed unmistakably that 0.5 mgs. of iron from these sources is distinctly potent in restoring to normal the hemoglobin content of the blood of anemic rats. The detailed data which led us to the above conclusions, together with a further analysis of this problem, will be published later. At this time we only wish to re-emphasize the fact that nutritional anemia induced by a whole-milk diet is an inorganic deficiency and that the *ash* of liver as well as the *ash* of certain plant materials is a potent source of the correctives.

J. WADDELL
C. A. ELVEHJEM
H. STEENBOCK
E. B. HART

THE LABORATORY OF AGRICULTURAL
CHEMISTRY,
UNIVERSITY OF WISCONSIN

SOCIETIES AND ACADEMIES

THE GEOLOGICAL SOCIETY OF AMERICA

At the annual meeting of the Geological Society of America, held in Cleveland, December 29, 30 and 31, 1927, the following officers were elected for the year 1928:

President: Bailey Willis, Stanford University.

First Vice-president: Alfred C. Lane, Tufts College.

Second Vice-president: William H. Collins, Geological Survey of Canada.

Third Vice-president: August F. Foerste, Dayton, Ohio.

Fourth Vice-president: Esper S. Larsen, Harvard University.

Secretary: Charles P. Berkey, Columbia University.

Treasurer: Edward B. Mathews, The Johns Hopkins University.

Editor: Joseph Stanley-Brown, New York, N. Y.

Councilors (1928-1930): George R. Mansfield, United States Geological Survey; William E. Wrather, Dallas, Texas.

Thirty-one fellows were also elected, bringing the total membership to 559.

The Cleveland meeting had the largest attendance in the history of the society, with a registration of 374. One hundred and eight titles of papers were listed on the program, and four general addresses were delivered. Abstracts of all papers presented had been printed and distributed in advance of the meeting.

The Penrose medal, given for outstanding achievement in geologic science, was presented to Prof. Thomas Chrowder Chamberlin, of Chicago.

The annual meeting of 1928 will be held in New York City.

CHARLES P. BERKEY,
Secretary

INDIANA ACADEMY OF SCIENCE

THE Indiana Academy of Science held its 43rd annual meeting at the University of Notre Dame, Notre Dame, Indiana, on December 1, 2 and 3, 1927.

The officers in this meeting were as follows: *President*, Frank B. Wade, Indianapolis; *Vice-president*, F. J. Breeze, Muncie; *Secretary*, Ray C. Friesner, Indianapolis; *Asst. Secretary*, W. P. Morgan, Indianapolis; *Treasurer*, M. W. Lyon, Jr., South Bend; *Editor*, John J. Davis, Lafayette; *Press Secretary*, Harry F. Dietz, Indianapolis.

The meetings of the academy proper were preceded by the annual informal meeting of the entomologists of Indiana on December 1. At the regular meetings of the academy the number of papers presented in the various sections were as follows: general, 6; bacteriology, physiology and hygiene, 6; botany, 27; chemistry, mathematics and physics, 35; geology and geography, 18, and zoology, 16.

The annual public lecture was given by Dr. Wilfred H. Osgood, curator of zoology, Field Museum of Natural History, Chicago, who spoke on "Nature and Man in Abyssinia," illustrating his lecture with motion and still pictures.

The officers elected for the ensuing year were: *President*, E. G. Mahin, Notre Dame University, Notre Dame; *Vice-president*, W. N. Hess, DePauw University, Greencastle; *Secretary*, Ray C. Friesner, Butler College, Indianapolis; *Asst. Secretary*, W. P. Morgan, Indiana Central University, Indianapolis; *Treasurer*, M. W. Lyon, Jr., South Bend; *Editor*, John J. Davis, Purdue University, Lafayette; *Press Secretary*, Harry F. Dietz, Department of Conservation, Indianapolis.

HARRY F. DIETZ,
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If vacancies occur, students from other institutions desiring advanced standing may be admitted to the second or third year provided they fulfill the requirements and present exceptional qualifications.

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SCIENCE NEWS

Science Service, Washington, D. C.

BROADCASTING PHOTOGRAPHS

IN broadcasting photographs from Station WEAF, in New York, and receiving them in a private home 25 miles away from the transmitting station, radio engineers have gone a step farther towards the day when broadcasting of pictures of events, as well as the events themselves, will be as common as broadcasting of music.

The sending apparatus developed by Dr. E. F. W. Alexanderson, of the General Electric Company, and used in the recent demonstration from WEAF, is essentially similar to that used by the Bell Telephone Company in sending photographs across the country by telephone wires, as that used by the Radio Corporation of America in transmitting photographs across the ocean by radio, and as that invented by C. Francis Jenkins, of Washington, and used by the Navy Department to send weather maps to ships at sea. Another form of the same apparatus has been developed by *Radio Broadcast Magazine*, which recently conducted the first sending of photographs by radio for reception on a set that could be built at home.

In all these methods, the heart is in the so-called photoelectric cell. This device takes a beam of light that falls on it, and converts it to electricity. It depends on the fact that when a film of metal, such as potassium or sodium, is illuminated, it gives off electrons. These are the tiny atoms of electricity, of which the atoms of matter are supposed to consist. Their motion inside the cell results in a minute electric current. Vacuum tubes like those in ordinary radio receivers can amplify this minute current millions of times, if necessary.

In the Alexanderson transmitter, the photograph to be sent is wrapped around a cylinder which revolves in the same way as the old-time cylindrical phonograph records. But instead of the needle and sound box of the phonograph, a lens focusses a spot of light from a tiny lamp on to the cylindrical picture. A toothed revolving disc breaks the reflected light up into a series of impulses bright or faint, depending on the brightness of the part of the picture illuminated at the time. These impulses of light fall on the photoelectric cell, which produces a varying electric current corresponding to the picture. This apparatus is connected to the radio transmitter replacing the microphone, and so the radio impulses go out from the aerial, carrying the picture with them.

In the device for receiving the picture any standard radio set can be used for converting the radio waves back to electrical impulses. But instead of feeding these impulses into a loud speaker to emerge as sound waves, they go to a box where they are amplified further. Then they go to a Moore neon lamp, a form of electric bulb in which the light is furnished by glowing neon gas, instead of a tungsten filament. Unlike the tungsten light, which takes a brief time to start glowing after the current is turned on, and which remains glowing for an instant after the current is off, the neon lamp goes on

and off instantaneously. On account of this advantage it has been extensively used in phototelegraphy and television. Forms of it were employed in the Bell laboratories system of television, demonstrated last April, and in Dr. Alexanderson's own television system, which had its public débüt a few weeks ago.

In this way a beam of light is obtained from the neon lamp that varies as did the beam reflected from the cylindrical picture in the transmitter. This beam is focussed on a sheet of sensitive photographic paper, which is wrapped around a cylinder revolving like the cylinder at the transmitter. Both cylinders slowly move in the direction of their length as they turn, covering the whole picture. About 90 seconds of broadcasting time is required for a 4½- by 8-inch picture. The photographic paper is taken from the receiving cylinder and developed in the same manner as any ordinary print, made from a snapshot negative. It is a facsimile of the original picture.

Other forms of apparatus for transmitting pictures by wire or radio have been demonstrated from time to time. Their chief differences are in the method of varying the light in the receiver. In the Bell apparatus, by which any one with the price can wire a photograph in a few hours from New York to San Francisco, a "light valve" takes the place of the neon lamp. An electric bulb of the ordinary type provides the light, and its intensity is varied by the valve, which in turn varies according to the current reaching it from the distant transmitter. The Cooley "rayfoto" device, that was demonstrated at the recent New York radio show by *Radio Broadcast Magazine*, uses an electrical discharge playing directly on the sensitive paper to form the image. In the Radio Corporation's radiophoto system, the amount of ink sprayed pneumatically on ordinary paper is regulated by the incoming current.

GAME ANIMALS IN THE SOUTHWEST

MANAGE your game animals and your livestock the same. This is the advice given to New Mexico sportsmen and ranchers by J. Stokley Ligon, of the U. S. Biological Survey. The once abundant wild life of the Southwest can be restored on the same basis as the deflated cattle industry by scientific range management and control of predatory animals, Mr. Ligon contends in his report on the wild life of New Mexico recently published by the state game commission.

"As an asset to the Southwest, wild life in the future can be made equal to a stabilized livestock industry," said Mr. Ligon. "It is one of the most valuable crops that can be produced; yet it has and continues to be the most recklessly abused. For the same reason that the Southwest is the leading year-around open range cattle and sheep country in the land, it is one of the best year-around game sections. The varying topography of the

NEW SCIENTIFIC BOOKS

The McGraw-Hill Book Company, New York

TRUCK-CROP PLANTS. Henry A. Jones and Joseph T. Rosa. pp. xiv, 538. \$5.00.

A survey of present information on truck-crop plants, making the plant the basis for discussion rather than certain practices or certain phenomena. Insects and diseases are discussed in considerable detail because of their special importance.

The Macmillan Company, New York

THE COMPARATIVE PHYSIOLOGY OF INTERNAL SECRETION. Lancelot T. Hogben. 148 pp. \$4.00.

Some chapters: The Role of the Ductless Glands in Developmental Processes; The Relation of Internal Secretion to Vasmotor Regulation; Endocrine Factors in Secretory Processes. The book is profusely illustrated.

Ginn and Company, Boston

THE EARTH AND ITS HISTORY. John H. Bradley. pp. vii, 414. \$3.00.

This book offers a comprehensive yet simple course, suitable to beginners who plan to continue the study of geology, but written primarily for those whose interest in the subject is cultural rather than technical. It provides a one-semester course for college freshmen.

The Oxford University Press, American Branch, New York

ANIMAL BIOLOGY. J. B. S. Haldane and Julian Huxley. 344 pp. 122 illustrations. \$2.50.

One of the Clarendon Science Series, which are intended to supplement classroom and laboratory instruction, and not to supplant existing text-books. Needless details are omitted.

Prentice-Hall, Incorporated, New York

INTRODUCTORY MATHEMATICS. Joseph E. Rowe. 285 pp. \$2.50.

For use in colleges and universities during the freshman year. The aim in selecting the material and in the manner of presenting it has been to acquaint the student with as much of the content of mathematics as possible and to train him in the facile use of mathematics as a tool.

The Cambridge University Press, London

INVARIANTS OF QUADRATIC DIFFERENTIAL FORMS. Oswald Veblen. 102 pp. \$2.25.

This constitutes the twenty-fourth book in the series of "Cambridge Tracts in Mathematics and Mathematical Physics." One purpose of the book is to assist the students of differential geometry and mathematical physics by setting forth the underlying differential invariant theory.

Methuen and Company, London

SIR ISAAC NEWTON. S. Brodetsky. 161 pp.

This book combines an account of the life and personality of Sir Isaac Newton with a clear statement of his great scientific achievements.

The Peking Union Medical College, Peking, China

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Every one who is interested in any aspect of the progress of American science and general education should be a member of the American Association. The value of the journal is greater than the membership dues. It is well worth while to be enrolled in the Association. An address list of all members is published from time to time.

All appreciative people owe aid and support for the progress of science and education to society in general, and the American Association offers the best means by which an individual may contribute toward this great movement. It is the only organization representing all American science workers in all fields.

MEMBERSHIP

Each annual member pays an entrance fee of \$5.00 and annual dues of \$5.00. Each receives a certificate of membership and an annual membership card. Any individual member of an officially affiliated organization may join the Association without payment of the entrance fee. Each life member pays \$100 and each sustaining member pays \$1000, these contributions being added to the permanent endowment of the Association.

If you are not already enrolled, now is the time to join. Applications and remittances should be sent to the permanent secretary's office, A. A. A. S., Smithsonian Institution Building, Washington, D. C., from which sample copies of the journals and information about the Association may be had at any time.

IF YOU ARE A MEMBER OF THE ASSOCIATION

You can help its work very much by sending to the permanent secretary's office, now or later, the names and addresses of persons who may be interested to become members; there are many thousands of such people in the United States and Canada. In 1927 over fifteen hundred new members were enrolled. This year a special campaign for new members is being planned to lead up to the great New York meeting next December. Will all members help?

BURTON E. LIVINGSTON,
Permanent Secretary.

state ranging from plains at less than 3,000 feet to mountain peaks at 13,600 feet results in the widespread distribution of more than fifteen distinctive game animals, ten species of resident land game birds, the many species of fish and a great variety of non-game birds."

It is man's domestic animals rather than his shot-gun which have nearly exterminated the native wild life in the Southwest, says Mr. Ligon. In the early days of free range the country was so heavily overstocked with cattle that the forage was badly depleted. This resulted in starvation for the game animals and birds and loss of the protective shelter of browse. While the stock suffered as much in a few years by these methods as the wild animals, the latter were able to find natural refuges in the rugged mountainous areas into which the stock could not penetrate. For this reason big game is still found all over the state except in the Navajo country which was completely hunted out before state game laws became effective. Deer, turkey and quail are now the principal residence game. Mr. Ligon recommends the restocking of depleted areas with native game, reintroducing such exterminated species as buffalo, elk and sage grouse, the establishment of refuges and the enforcement of strict game laws.

THE ART OF INSANE PATIENTS

ART critics of Paris are interested in an exhibit of painting and sculpture by patients afflicted with mental disease, according to reports received by the American Medical Association from its French correspondent.

It is a difficult matter, apparently, to choose between the psychopathic art and the products of the ultramodern school, futurists, cubists and the like. Only the work of patients who were not artists before their admission into institutions, it is stated, are included in the exhibition.

This does not necessarily mean that the ultramoderns, who paint voluntarily the impressions of the subconscious mind, are insane, in the opinion of Dr. August Marie, a well-known French expert on mental disease. Such artists contend that they give free rein to their emotions and depict their inmost dreams without the control of reason very much after the manner of spontaneous art of savage tribes and prehistoric races.

The insane merely describe the vagaries of their subconscious minds and hallucinations for the satisfaction they get out of it. Most of them have no notion of technique, yet one painted in quite unearthly colors, roaring flames and waves of fire worthy of Turner. This picture was bought by a wallpaper manufacturer to serve as the basis of a new wallpaper design. A psychopathic priest depicted a pope blowing soap bubbles before an assemblage of swooning frogs.

The French expert believes that some of the paintings, if removed from their environment and placed in the collections of a reputable dealer, would command high prices.

ITEMS

ONE of the largest group of spots observed in recent months is now crossing the face of the sun, according to

Professor George H. Peters, of the U. S. Naval Observatory. Professor Peters takes photographs of the sun every clear day, and he first noticed the spot, "as it came around the eastern edge of the sun, on January 17. On Friday, January 20, he photographed it again, and estimated its size as approximately 125,000 miles, or about half of the distance from the earth to the moon. Sun-spots shoot out rapidly moving electrons, or "cathode rays," and when directly pointed towards the earth, the earth receives them. Under the influence of the earth's magnetic field, they cause the rarefied gases in the earth's upper atmosphere to glow, thus producing the aurora borealis, or "northern lights." Professor Peters pointed out that several years ago he predicted that the maximum of the approximately eleven-year period, during which the numbers of sun-spots wax and wane, would be reached late this year and that it now looks as if this prediction would be fulfilled.

DR. S. BAYNE-JONES, of the University of Rochester Medical School, has taken motion picture reels of thousands of generations of bacteria that enable a spectator to follow them through many days of growth and activity in a few minutes. Micromovies will aid biologists in working out obscure growth processes of many rudimentary forms of life, it is said, and in addition, classroom reels may be made for the instruction of students of medicine and industrial bacteriology. One of the chief difficulties which had to be overcome was to maintain the microscope in accurate focus, which required elimination of vibration from the camera part of the apparatus. Most of the negatives which have been made to date call for one exposure a minute, and when the positives have been prepared they are run through the projector at the rate of 16 pictures a second, which gives the effect of compressing the life histories of the microscopic plants and animals.

AMERICAN automobile owners can save gasoline by using engines that operate at a constant instead of a variable pressure, Professor H. M. Jacklin, of Purdue University, has reported to the Society of Automotive Engineers. Present auto engines operate so that the volume of the gaseous fuel exploded is constant. Professor Jacklin's experiments were made upon an experimental engine constructed with a movable cylinder-head that was used to reduce the volume of the cylinder as the speed of the engine decreases. This maintained the same pressure within the cylinder at all speeds. No adjustment of spark was necessary. Gains of up to 50 per cent. in miles per gallon might be expected if the new type engine were substituted for the ordinary engine now in use. Fuel bills would be cut a third, according to Professor Jacklin's computations. Assuming a complete substitution of the constant compression engine in the 20,000,000 cars now running 6,000 miles a year on 20 cents per gallon gasoline, Professor Jacklin sees the possibility of conserving our natural resources and the national pocketbook to the extent of some four hundred millions annually.